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ABSTRACT

During 1990, a model of general education in which academic studies were challenged by a new vision of vocational preparation was pilot tested. Anticipated outcomes were a renovation of academic and vocational education through the interaction of collaborating teachers and an enriched form of vocational education. The pilot testing involved seven steps: (1) selection of sites--a large metropolitan area in Minnesota and a rural area in Wisconsin; (2) selection of five vocational and five academic teachers at each site; (3) planning and staff development with educators from each pilot site; (4) review and development of the curriculum units; (5) teaching of the curriculum; (6) assessment of the impact of the curriculum intervention; and (7) data analysis and reporting. Evidence was collected through observation, interviews, and student questionnaires. Students reached the planned objectives of the unit of instruction, experienced a richer general education and a different vocational education, exhibited a positive attitude change, and perceived teachers as working together. Teachers taught new content, organized and presented material differently, learned how to continue collaboration, and improved communication among themselves. Recommendations are made for more field work to expand and refine knowledge on integration and innovation in vocational and academic education and research to restructure and redesign the comprehensive high school. (Appendixes include a list of 18 references, materials to support project planning, a chart showing research questions and data collection strategy, and data collection instruments.) (YLB)

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AN UNCOMMON EDUCATION: INTERACTION AND INNOVATION

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INTRODUCTION

From a national perspective, the United States is challenged by educational advances in other countries, both Eastern and Western, to substantially increase the accomplishments of its educational systems. Economically and politically, vocational education is an important component of this educational system. A framework is needed in order to guide vocational education into the future and place the several vocational education related curricula (i.e., agricultural education, home economics education, industrial arts education, cooperative education, career education, principles of technology, and entrepreneurship) into a coherent system. The framework should also provide a basis from which to relate vocational education and academic education. Further, the framework should be responsive to the needs of a plurality of groups served by vocational education (i.e., both sexes, minorities, immigrants, the handicapped, gifted individuals, and adults seeking retraining). The research, of which this project is a part, is focused on developing a framework for these purposes.

The framework of this project is not what usually constitutes education. The common form of education is like an egg with two yolks, one vocational and the other academic. In this project, the teachers from these two areas of education interacted. The twin curricular areas remain, but the communication of the participants becomes the interaction of teammates. The principals of the two high schools that modeled this uncommon education supported the interaction; the administrative support was found to be indispensable. When most successful, the teammates stimulated one another. Partners were led to see possibilities in their subjects that had not been evident in most of their professional preparatory programs. This is why this project is said to have begun a discussion of an uncommon education, one in which curricular innovation is a byproduct of disciplinary interaction.

Purpose of Project

The focus of this year's work was field testing the subject matter foundations, the integration strategies, and the curricula based on the conceptual framework derived from the work begun in 1988 and continued in 1989 through the National Center for Research in Vocational Education (NCRVE). There are two major strands to the research: (1) defining

the unique subject matter of vocational education and (2) developing the interaction between vocational and academic education.

In 1990, these two strands of research were intertwined like the strands of a rope in a field test of previously developed ideas at two comprehensive high school sites. One site in Minnesota represented a large metropolitan area and the other site in Wisconsin represented a rural area.

The purpose of the field work was twofold. School administrators, counselors, and vocational and academic teachers were to be involved in (1) a review of the conceptual framework of the subject matter of vocational education (strand one) and an integration of vocational with academic education, and vice versa (strand two); as well as in (2) the process of developing, teaching, and evaluating curricular units consistent with the above ideas.

We used individual and group interviews, classroom observations, and the analysis of documents and lesson plans, consistent with the interpretive research methodology, in order to understand the impact and feasibility of the ideas brought forth for collaborative review. We were interested in whether the ideas made sense to educators working in comprehensive high schools. An additional interest was in gathering/developing curricular units of instruction that exemplified the conceptual framework and project strands noted above. The results of the data analysis and a description of the collaborative processes are shared in this report.

Major Project Strands

Since 1988, the NCRVE's investigation of the subject matter of vocational education has gone forward with two conspicuous strands. The philosophy which inspired and led this research was thoroughly developed and described in the following reports published by the NCRVE: *Polytechnical Education: A Step* (Beck, 1990); *Vocational Preparation and General Education* (Beck, 1990); *Subject Matter of Vocational Education: In Pursuit of Foundations* (Copa & Tebbenhoff, 1990); *General Education: Vocational and Academic Collaboration* (Beck, 1991); and *What Should be the Subject Matter of Vocational Education?* (Copa, in press).

A significant review and synthesis of the curricular research in vocational education, including career education, can be found in the *Handbook of Research on Curriculum* (Copa & Bentley, in press). This literature on career education added to our understanding of vocational education and general education, our main targets in this research.

The previous work can be summarized and interrelated briefly in the following way. In regard to the first strand, defining the unique subject matter of vocational education, the focus in 1988 was on the foundations of vocational education. A multidisciplinary study group was used to clarify the meaning of "foundational" in a curriculum context and to formulate questions which would be addressed to develop the foundations of vocational education. The questions relating to foundations focused on the meaning (i.e., focus, uniqueness, methods), structure (i.e., within, in relation to other subjects), and academic underpinnings of vocational education. This research was published by the NCRVE under the title of *Subject Matter of Vocational Education: In Pursuit of Foundations* (Copa & Tebbenhoff, 1990). The report illustrates the potential contribution disciplines such as economics, sociology, philosophy, the physical sciences, and history can make to the study of vocational education. Briefly, during 1988, the first strand focused on the integration of conventional academic education into the usual offerings of vocational education.

During that time, the second strand focused on a complementary issue: the integration of vocational education into academic education. This dimension was approached by an in-depth investigation of polytechnical education in the Soviet Union. The point of the examination was to analyze and reflect upon the extent to which ideas basic to polytechnical education show both integration of vocational and academic subject matter and applicability to educational integration in this country. The result of this study was *Polytechnical Education: A Step* (Beck, 1990a).

During 1989, the first strand was involved with the development of a tentative conceptual framework for the subject matter of vocational education (Copa, in press). The framework (see Figure 1) suggested that the content of vocational education should be derived from the significant, continuing problems or concerns which are addressed in vocational life. These problems or concerns are in turn derived from contrasting the desired state of affairs in vocational life with the present state of affairs (i.e., ought versus

is). The two major dimensions of vocational life are work life and family life. The tentative concerns of vocational life are as follows:

- Understanding vocational life—Anticipating and making sense out of the problems encountered in vocational life at work and in the family (i.e., How does work and the family fit into our culture? Why does this problem have to be dealt with now? What is the desired state of affairs in the workplace and in the family? What is the present state of affairs?).

- Rights and responsibilities of vocational life—Distribution of power and authority encountered in work and in family life (i.e., What are my responsibilities at work and at home? What rights should I have?).

- Relationships in vocational life—Interrelationships among individuals at work and in family life (i.e., How should I relate to peers? How should I relate to subordinates?).

- Technology in vocational life—Dealing with technology and technological change in work and in family life (i.e., How should I cope with technological change at work and at home? Is this technology helpful?).

- General vocational life competence—Concerns which are procedural in nature, but general across various vocational responsibilities (i.e., problem solving, creative thinking, learning to learn, communications, computation, and leadership).

- Specific vocational life competence—Concerns which are procedural in nature, but specific to selected vocational responsibilities (i.e., an automobile mechanic's ability to adjust a carburetor, an accountant's ability to balance a budget statement, and a parent's ability to discipline a child).

- Managing vocational life—Managing one's own work and family life (i.e., selecting a preferred type of lifestyle, using resources appropriately, and considering needed changes).

In 1989, the second strand continued to be preoccupied with the integration of vocational education into academic education by suggesting topics which academic subject matter conventionally ignored. The result of this work was published by the NCRVE in *Vocational Preparation and General Education* (Beck, 1990b). The interest in general education also resulted in a historical and philosophical analysis of general education and its relationship to vocational and academic education in *General Education: Vocational and Academic Collaboration* (Beck, 1991).

During 1990, the two strands joined in the pilot testing reported here. Figure 2 presents an overview of the two major strands of the project as they served as a focus for pilot testing activities. We have been at pains to underscore two things: the importance of a true collaboration and the central place in the high school of a genuine general education with an enriched content for vocational education.

Given the centrality of the terms "collaboration," "general education," and "enriched" vocational education, a brief review is in order. Those involved in the pilot testing discussed collaboration and general education, stressing that collaboration involved more than team teaching. The product of collaboration was to be something new. There was to be a genuine interaction. In this interaction, both vocational and academic education were to be transformed to result in an enriched general education. (See *General Education: Vocational and Academic Collaboration*, Beck, 1991, for examples of this collaboration and transformation.) The historical record shows that a universal component of a country's system of education has been called general education. The term "general" was to imply that all members of the society, all citizens at least, were to command what made up the general education.

While general education has been evident for centuries, its content has been altered with the pressures of a particular time and place. Today it is common knowledge that some degree of acquaintance with technology, its scientific and mathematical base, together with its social and cultural consequences, is essential to a general education in the high school. Vocational preparation, at the secondary level and beyond, certainly has been transformed by science and technology. The reality of this transformation of vocational preparation is due to what is happening in society and culture. Academic subjects should show this to be true and have a good deal to contribute to, and take from, vocational studies. Collaborating

teachers should profit from sharing their insights into what is happening to society and culture, and why it is happening.

This program of research began in 1988 with a view of general education as overlapping a little with vocational and academic education as shown in the upper part of Figure 2. What now is being pilot tested is a model of general education in which academic studies—the sciences, including social studies—are challenged by a new vision of vocational preparation. Both vocational and academic teachers selected to work on this project have had an opportunity to collaborate. As has been said, the result could be a mutual restructuring of the vocational and academic subjects. From an equity and social stratification perspective, this renovation of the vocational and academic through the interaction of collaborating teachers could result in an enriched form of general education for the secondary school rather than the three separate "tracks" in the curriculum now under critique. What we could have is an enriched *common* education for *all* students with more obvious and stronger contributions made by *both* vocational and academic education.

At the same time this new form of general education is being tested, there is also attention being paid to an enriched form of vocational education. As shown in the bottom portion of Figure 2, the content of vocational education has been expanded beyond what has been viewed traditionally (and sometimes stereotypically) as only specific technical skills. These added problem areas will provide many more opportunities for collaboration among vocational and academic educators. This view does not reduce the importance of technical skills, but suggests they are only one, albeit important and maybe even central, component of a sound vocational education.

The central focus of this research and the pilot testing during 1990 was on the subject matter of vocational education. The agenda of the field testing was kept as the top priority of the research. At the same time, with collaboration of vocational and academic educators under scrutiny, the investigators did not lose sight of the possibility of a new form of general education.

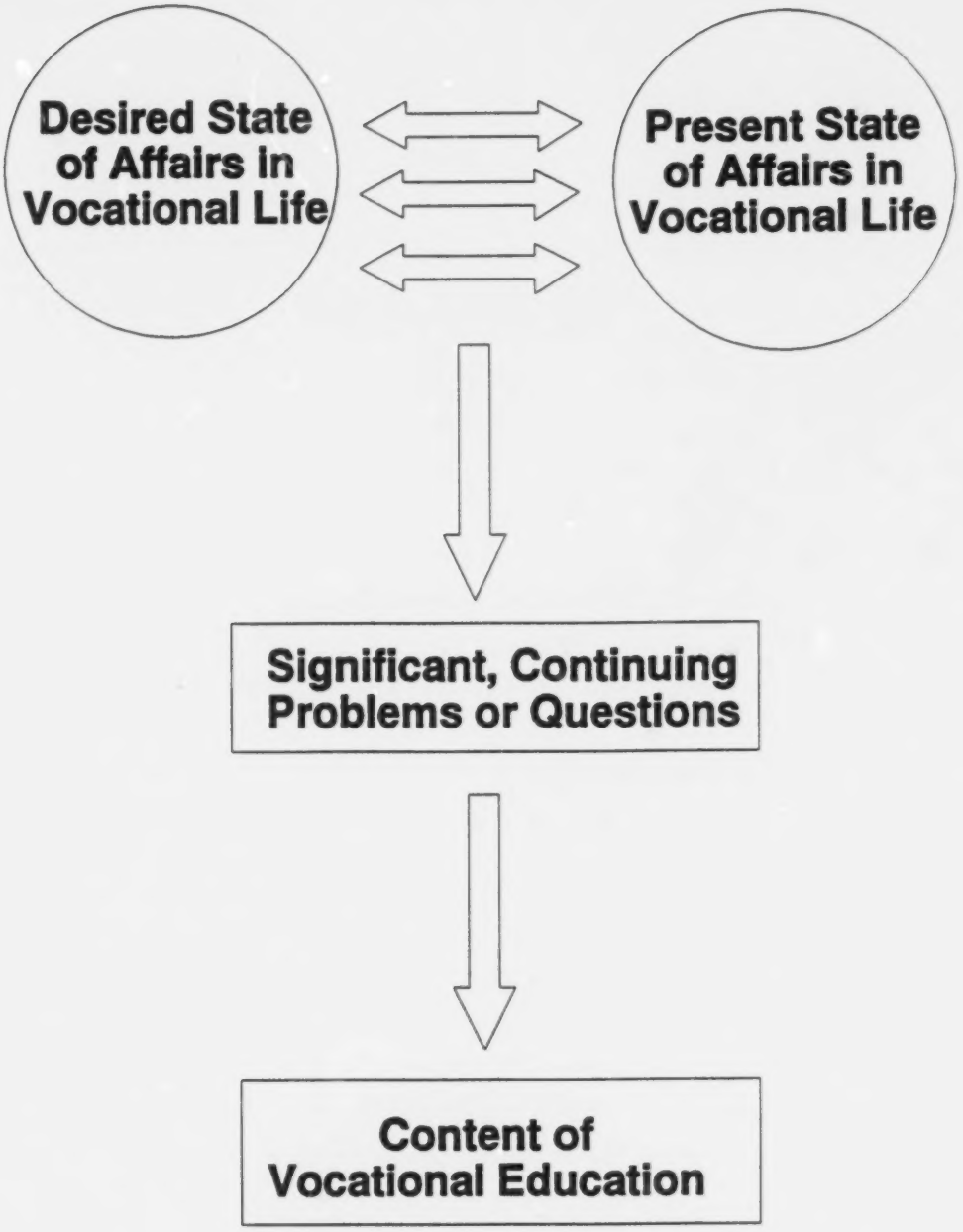
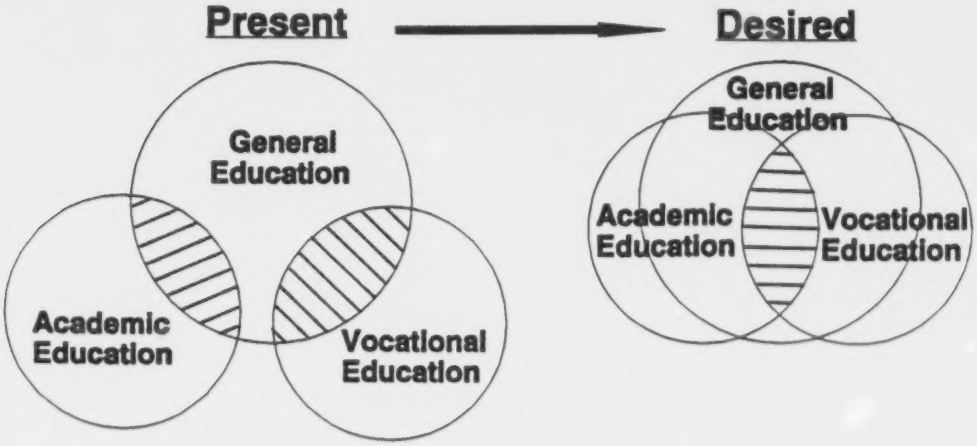

Desired State of Affairs in Vocational Life
Present State of Affairs in Vocational Life
Significant, Continuing Problems or Questions
Content of Vocational Education

Figure 1: A conceptual framework for deriving the content of vocational education.

1. Enriched general education for all students



2. Enriched subject matter of vocational education

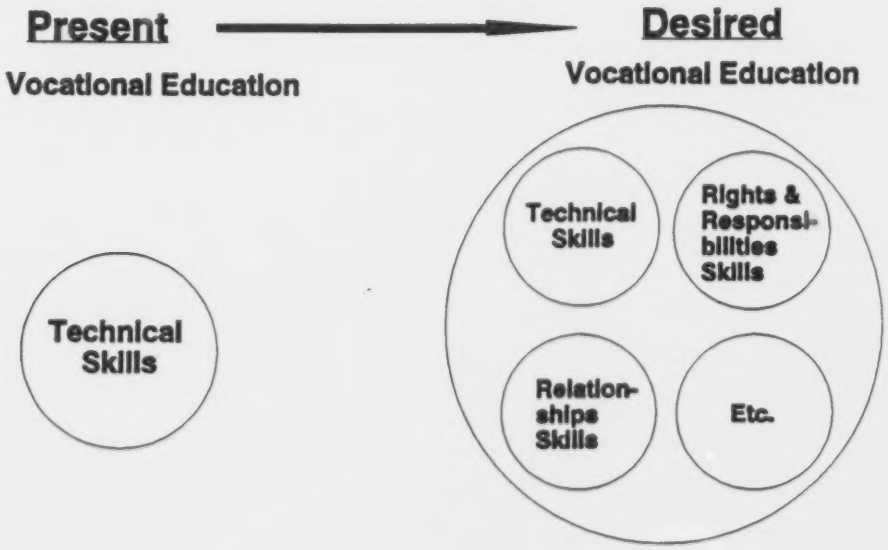


Figure 2: Major project strands and focus of field testing.

Approach to Pilot Testing

The pilot testing involved a series of seven steps. The first step was selecting pilot sites that represented an urban area and a rural area. The restriction to two sites was a result of the resources available for the pilot testing. In selecting the two pilot sites, attention was paid to identifying sites that were willing to participate, particularly in terms of administrative support.

The second step was the actual selection of the educators to be involved in the project. This was done by administrators at each site. The project was designed to involve five vocational teachers and five academic teachers at each site as well as representatives of the administration. In one of the sites it turned out that the counselors were also involved in the pilot testing.

Step three involved planning and staff development with educators from each of the pilot sites. This was done during the summer of 1990 in two separate, two-day sessions for each of the sites. The specifics of these staff development and planning sessions will be described later. Essentially the activities of this step were planned to better acquaint the educators with the project and the general ideas to be tested and to get their reaction to these ideas; to allow the educators to get better acquainted; and to develop the idea of the educators as collaborators in the research project. Consistent with action research methodology, the research team approached the educators as colleagues in development of the plans for the project, the research questions, and the ways to arrive at answers to the research questions. The educators were told they needed to make four contributions during the project. First, we wanted them to listen to and review our initial ideas to see if they made sense—that is, were the ideas feasible in terms of the context in which the teachers practiced, and what questions did the ideas raise in their minds. Second, we wanted them to help make our ideas concrete in a specific context—that is, to put the ideas in action so they could be experienced and could be pointed to in very concrete terms as examples of the ideas in action. Third, we wanted them to reflect with us on what seemed to work and not work with respect to our ideas as they were put into action—that is, how could the ideas be improved, what were the effects, and what might be some next steps. Fourth, we wanted the educators to leave us with some artifacts—that is, materials, lesson plans, student activities, and experiences that we could use in the future to give a more concrete idea of what we had in mind with our project purposes.

The fourth step in the pilot testing had to do with review and development of the curriculum units that would be taught. As noted above, this was initiated during the two-day, summer planning session where the educators developed an initial plan for the intervention at their teaching sites. There was an opportunity to revise this plan later in the summer, and we remained "on-call" to provide technical assistance as the participants did the revision. A group session to review their plans for actual intervention in their classrooms was held just before school started.

The fifth step in the pilot test was the actual teaching of the curriculum sometime in the Fall. The sixth step was assessing the impact of the curriculum intervention. The assessment was guided by a set of research questions which were strategic for collecting data or evidence. Evidence was collected through observation; through interviews with administrators, teachers, counselors, students, and others; and through questionnaires that were given to students. The seventh and final step in the field test was the data analysis and reporting which is a part of this report.

SELECTION AND TRAINING

Selecting Pilot Sites

The selection occurred during the spring of 1990. It involved consideration of potential school systems in Minnesota and Wisconsin which would meet the general criteria for an urban site and a rural site. The urban site contacted first was St. Paul, Minnesota. The project staff was aware that St. Paul schools were in the process of studying their vocational education courses at the secondary level; they had an active advisory committee for the vocational education programs; and they were also interested in relationships between vocational and academic education. Contact with the St. Paul public schools was initiated through Dr. Kathleen Stuart, who managed secondary vocational education for the school system. Dr. Stuart, in turn, did checking with other central administrations in the St. Paul public schools. Eventually Humboldt High School was selected as the project site. It was then up to the principal at Humboldt High School to select the teachers to be involved in the project; there would be approximately five vocational teachers and five academic teachers participating.

The Minnesota pilot site was an International Magnet High School. It had ties to both the University of Minnesota and the University of St. Thomas in St. Paul. All curriculum in the school was required to reflect a multicultural, gender free, and disability free perspective.

For the rural site, attention focused on Wisconsin. It was within easy travel range, given the project budget, yet allowed for participation of another state. Here contact was made with a staff member of the Cooperative Educational Service Agency No. 11 (CESA 11) Regional District which borders on Minnesota. The person responsible for curriculum and staff development in this regional planning unit was Dr. Donna Coomer. After conversations with Dr. Coomer regarding the criteria and desired features for a project site, New Richmond Public School was selected as the test site. New Richmond is located approximately forty-five miles northeast of the Minneapolis/St. Paul area and represents a rural district with a comprehensive high school. Contact was made first with the superintendent of schools and then with Tom Wells, the vocational agricultural teacher. In consultation with the assistant principal, he took responsibility for identifying teachers to be involved in the project The principal was not available in the early summer because the school district was in the process of hiring a new principal. Mr. Wells, with the help of the assistant principal, Ev Glaser, selected approximately five vocational teachers and five academic teachers, plus the counselors from the school system, to be involved in the project.

The Wisconsin pilot high school was influenced by a state education mandate for employment which used business/community/education partnerships. For several years, the high school had also been a pilot site for the Wisconsin Department of Public Instruction Family and Consumer Education Project which emphasized social and intellectual processes. A new mission statement for the high school reflected the challenges for education present in "an ever-changing world."

Each of the pilot sites received $5,000 to cover the costs of curriculum development—specifically including time for participant training and planning—materials, and substitute teachers. One person at each site was responsible for handling the expenses.

Training of Pilot Site Staff

The purposes of the training sessions were as follows: (1) to become better acquainted as professionals who were willing to look at the issues surrounding vocational education and the relationship between vocational and general education; (2) to share information and expectations for this research project from the NCRVE's perspective; and (3) to collaborate as research colleagues in developing plans for implementation during the Fall. The training sessions were organized after conversations with staff at each of the pilot sites. The Humboldt staff suggested that the best use of training time would be two days in the summer and one additional day around the start of school. The project directors and the New Richmond staff concurred. Training dates were mutually agreed on with the help of the on-site coordinators. The agenda for one of the training sessions is shown in Appendix 1. The activities and strategies used to accomplish the goals of the training sessions were organized according to the purposes of the training.

Purpose 1: Getting better acquainted as professionals.

Purpose one was accomplished through a case scenario exercise. The case issue was selected on the basis of educator interest, lack of pre-set answers, and local interest. The scenario incorporated facts about the Milwaukee Public Schools as well as a legislated voucher plan for poor families. During a two hour time block, the participants talked at length and in a personal way about the problems presented in the case scenario. In small integrated and interactive groups, the participants prepared responses to the issues. The issues of the case were not directly related to the purposes of this project (see Appendix 2 for copy of case study). The key factor in accomplishing the first purpose was the interaction of vocational and academic teachers. As the teachers discussed solutions to professionally challenging problems in the case, they became better acquainted. They also reflected more generally on the problems they encountered in dealing with difficult questions in education.

Purpose 2: Sharing information and expectations for this research project from NCRVE's perspective.

Purpose two was accomplished with presentations by Robert Beck and George Copa about their previous work in this research program. The project directors explained the two strands of work. The first strand was the conceptual framework for the subject

matter of vocational education, and the second strand was the integration of vocational education and academic education to enrich general education. As a group, the participants discussed the following issues:

- What is "real vocational education"? Does "real" imply equipment and labs?
- What would this look like in practice?
- Does this conceptual framework of vocational education make sense? If it does, how can we extend the idea to more people?
- How can we keep the needs of students in mind?
- How important is collaborating?
- What are the standards for maintaining rigor in the curricular units?
- What features of a wider view of general education would benefit students?
- What is possible when vocational and academic teachers interact about their subject matter?
- Does general education (in this country and in other countries) include technology and science? If it does, can you leave vocational education out?
- How can general education outcomes be satisfied with vocational education materials?
- How does a historical approach demand integration between the vocational and the academic: history of ideas, history of social development, and history of design?
- How can school programs be enriched through the knowledge that teachers have much to offer each other?

Purpose 3: Collaborating as research colleagues in developing plans for implementation during the Fall semester.

The third purpose of the training was accomplished on the second day of training. Over a seven hour time frame, participants addressed two subgoals: development of a research plan and development of a tentative personal Plan of Work. Project directors used group discussion to guide participants through framing the research questions, developing the plan of study, and identifying evidence to answer the research questions. The participants used individual writing time and two-person conversations to facilitate development of a tentative written Plan of Work. Three guidelines were used for this purpose: (1) "Potential Ideas for Action"; (2) "Criteria for Use in Selecting Among

Potential Ideas for Action"; and (3) "General Plan of Work" (see Appendix 3). All tentative plans were given to the project directors at the end of the second day. Plans were returned, with comments, to the participants the following week.

The following comments were made by participants during and after the training session:

> We can do this.
>
> This research project could be used to help bring down the invisible walls which separate departments and teachers.
>
> This was the best workshop I have ever attended, and I have been to many.
>
> We see each other in the halls and say, "Hi!" and talk some, but we never have talked like that before.
>
> After the training, teachers are prepared to work together on the purposes of this project.
>
> Are we going to be paid for these days? (Three teachers had participated in two full days of training without certainty that they would be paid for workshop time.)

In addition, one principal commented that the quality of the training by the project directors was the best he had experienced, and he was fully supportive of this research effort.

The follow-up after the training session occurred as follows:

- One week after training.
  Before they were mailed back to participants, the investigators read and commented upon each of the individual tentative Plans of Work. The types of comments used were as follows:

  > This is an important idea.
  >
  > Have you thought about . . . ?
  >
  > How might a vocational teacher (or anthropology, history, . . .) think about this part?
  >
  > [Vocational, anthropology, history . . . teacher] has a similar idea; maybe you could talk to him/her about it.

The purpose of the comments was to encourage the teachers to extend and focus the ideas during the summer incubation period.

- One to two months after training.
  Attempts were made to phone each participant and discuss the plan of work. This was successful with all but two individuals. Project staff also kept close contact with the designated coordinator from each pilot site. Each participant received two letters during the summer. The purpose of the first letter was to encourage continuing collaboration between vocational and academic participants. The purpose of the second letter was to stimulate further thinking about the seven problem areas in the conceived framework for the vocational education subject matter.

- Two to three months after training.
  Participants at each pilot site attended a two hour meeting after school. At that meeting the participants shared the details of their Plans of Work. General discussion of issues and questions reflected the participants' concerns about (1) time constraints, (2) conflicts in priorities, and (3) scheduling constraints. Other issues were shared one-to-one after the meeting. These included individual project problems and interpersonal and collaborating difficulties.

The research strategy and questions developed by participants during the summer training session were also shared at this meeting. Participants seemed comfortable with this part of their involvement. Immediate concerns remained focused on preparing interesting and relevant units of instruction for their students. The participants indicated tentative timetables for their instruction so observation and data collection could be scheduled.

IMPLEMENTATION

The implementation of the project at each of the pilot sites is presented in two separate sections. The first section is entitled "Educational Interventions," and the second section is identified as "Analysis of Interventions." Each section presents information about the interventions that were made by the educators at each site. Sometimes an intervention involved one teacher, sometimes two teachers working as a team, and, in other cases, more than two teachers. The nature of the interventions and how they were categorized will become more evident after reviewing the descriptions of each intervention. We asked the educators to develop an intervention for one of their classes that would last about two weeks during the Fall of 1990. In each case, there was collaboration among vocational and academic teachers in designing the intervention and, in most cases, in the actual implementation of the intervention.

Educational Interventions

Each intervention was influenced by the purposes of the research project and the uniqueness of the pilot high schools. The interventions were concrete representations of the ideas presented earlier in this report. They show the influence of international education in one site and education for employment and Family and Consumer Education Pilot School initiatives in the other.

Academic Technology

Graphic Arts with Mathematics, Gifted and Talented, English, and Special Education. Students were in grades 7 through 12.

The Macintosh computer laboratory in the industrial technology area became the center of several collaborations initiated by the industrial technology teacher. Using an active outreach strategy designed to reach teachers and students who were unfamiliar with the graphic arts curriculum, the teacher developed a group of services called "Academic Technology."

Collaboration with college preparatory English, special education, and college preparatory mathematics:

During the first period of the school day, the graphic arts teacher served as a technology specialist for a number of academic teachers and their students. College preparatory students wrote and produced business letters (a district graduation competency requirement); special education students wrote and produced a newsletter about their program; and intermediate graphic arts students served as peer tutors. During the seventh period of the day, geometry students planned to design and produce printed logos using abstract geometric concepts. Scheduling problems prevented the mathematics teacher from coming to the laboratory with students, and the geometry students did not have the prerequisite computer software skills to work independently. The mathematics teacher planned to purchase and install a Geometric Supposer program on the system. With this, the geometry students would be able to participate in the technology laboratory with added support during Spring semester.

Collaboration with gifted and talented:

In addition, all seventh grade introductory graphic arts students learned technical reference skills from the gifted and talented teacher. Utilizing the resources of the public library, the students chose topics, located and read current technology reference materials, and wrote and produced individual reports. These reference skills will remain a part of the Industrial Arts curriculum; they also satisfy a district graduation competency requirement.

Key factors:

Several factors helped make the collaborations successful—the flexibility of the teachers, the student-centered classrooms, and the project-centered structure of the classrooms. The complicated scheduling for these collaborations was facilitated by the school administration. Student peer tutors, the intermediate and advanced vocational students, helped inexperienced students to be successful with the computer hardware and software. The industrial technology teacher encouraged a heterogeneous mixing of students. For example, disabled students served as peer tutors for the students from English class.

ACME Crew

Home Economics (Family and Consumer Economics), Wood Technology, and Social Studies teachers collaborated on this teacher-selected, problem-focused curriculum. The guidance counselor assisted the teachers. Their second hour students, grades 10 through 12, participated. As of this Fall, all students must take one Economics course for graduation. They can meet the requirement with either Family and Consumer Economics, Agriculture Economics, or Economics in the Social Studies Department.

ACME Crew developed from a case scenario which was written by the wood technology teacher. The case concerned a family-owned furniture making business that was failing. The family members in the scenario were described as "going way back to the great grandfather who practically invented the tree." Over a nine week period, saving the furniture company became the real work of the second hour classes. The students called their business ACME Crew; the name and logo were silk screened onto T-shirts for all of the "employees."

Through role playing, the students worked to save the company. Students interviewed for the six person management team. They also applied for work in their area of interest (sales and marketing, production, inspection). They used strategic planning to focus turnaround efforts, market research and planning to determine new products, human resource support for personnel problems, and worked as teams and in assembly lines to produce the products. They decided to produce decorative shelves and locker shelves to be sold both in school and in the community.

For the company to succeed, the students needed to exhibit flexibility. They needed to use complex communication skills, team problem solving skills, management skills, and production skills. The wood technology students had the added responsibility of training beginning production workers. The curriculum unit included entirely new material and teaching methods for the three classes, yet the concepts that were learned were a part of the previous courses' objectives.

The three teachers acted as outside consultants to the business. While often tempted to give answers, they felt they were most effective as problem solving facilitators.

Participation in ACME Crew was voluntary. The guidance department handled the students who were "unemployed" by putting them under the care of other teachers. Non-participants could choose a classroom setting and learn the material from the textbook. By the fourth week, all students were actively participating. As a way to mix students, one third of each class was recombined with part of the other classes. In this way students worked with different students and in areas of the high school building which they did not usually frequent. ACME Crew had become so real for the students that the teachers were concerned about how to end it after the nine week period.

Key factors:

This project was exemplary of the proposed conceptual framework for the subject matter of vocational education. Because it was a problem-centered unit of instruction, without a preconceived answer, the students and the teachers dealt with practical problems of work life as each arose over the nine week period. All participants recognized that the real world of work contains many such unanswered problems which need solutions.

Biotechnology Tissue Culturing and Groundwater Quality

Agriculture teacher collaborating with General Biology teacher. Students were in grades 10 through 12. General Biology is a graduation requirement.

For one week the biology teacher and the agriculture teacher taught four of each other's classes. A student teacher in agriculture education worked with both teachers during this time. The biotechnology material was new to the curriculum. Previously the students had only heard about the concept. The ground water quality lessons were extensions and reinforcement of concepts from the existing curriculum, but they differed in teaching method and by depth of subject matter.

The agriculture teacher taught a unit on groundwater quality to four biology classes. Focusing on local St. Croix County's problems, the teacher included information about soils, soil surveying, leeching, a water pollution demonstration by the Soil Conservation Project, discussions about solutions to local problems, and a field trip to the Glen Hills Watershed. The teacher emphasized the implications of chemical use in groundwater quality.

The agriculture students in grades 9 to 12 learned about genetic engineering in biotechnology from the biology teacher. The students observed actual preparation and incubation of carrot and Venus's-flytrap tissue cultures. They learned what "genetically-altered" means and discussed the consequences of biotechnology, particularly its economic issues.

Key factors:

This intervention directly benefitted the school district in two important ways. A greenhouse will be built by the Fall of 1991. Teachers from science and agriculture education will write and teach the subject matter which will use the greenhouse as a laboratory. Secondly, these two teachers are spearheading an environmental education curriculum for the entire district.

Career Resource Guide

English (Career Communications) with Guidance. All students and teachers from the Fall semester on will benefit. Career Communications fulfills one year of the English graduation requirement.

Initially, the major activity of this collaboration was for the Career Communications classes to gather career information from resource speakers and business tours. In the preplanning discussion, the English teacher and the guidance counselor discovered that one major goal for the Fall semester was the development of just such a base of information. Therefore, the project developed with a wider scope. Use with the Career Communication class was postponed until later in the school year.

The teacher and the counselor developed a Resource Guide of speakers and business tours which were available to all teachers in the Fall. A database was also going to be made available on a floppy disk to any teacher in the district.

Key factors:

Two important sources of information helped this project take on the level of importance that it achieved. The first was the needs' analysis which the collaborating teachers conducted. They collected information from two important groups. They started by identifying the areas of greatest concern to the English students. Concerns included (1) having a successful image, (2) using the telephone to project a positive image, (3) managing stress, (4) getting along with family and co-workers, and (5) recognizing problem ownership. The second group was the business community. Using his connection with the local Chamber of Commerce, a survey was conducted by the guidance counselor. The second key factor was that the English teacher, as a private enterprise employee during the summer, had a great deal of experience with the production and personnel functions of a major enterprise in the town.

Families: Multicultural Perspectives

Home Economics Family Studies teacher with French teacher, Japanese resource teacher, and Hispanic community representative. Students were in grades 10 through 12 from two Family Studies classes.

The overall purpose of this unit of instruction was for the students to learn more about selected aspects of families which have different cultural backgrounds. Beginning with "what is a family," the teacher introduced different types, functions and dysfunctions, and heritages of families. Resource people, knowledgeable about France, Japan, and Mexico, presented information about family structure and values. All students had the opportunity to share stories from their own heritage, orally and in writing. Further, students were assigned questions asking them to compare and contrast the types of family heritages they learned about.

Key factors:

Two factors helped assure the success of this unit of instruction. The first was the diverse ethnic backgrounds of the students in the classes. There were many opportunities to share from their own family histories. Secondly, the Family Studies curriculum reinforced academic requirements for oral and written presentation. Students were aware that research papers were required, written material would be graded for style and grammar, and oral sharing was a course expectation.

French Automobiles: Vocabulary, Verb Tenses, and Economic Issues

French teacher with Automobile Mechanics teacher. Students were in grades 8 through 10.

The primary focus of this intervention was the reinforcement of the required curriculum for second year French. This was accomplished by utilizing the automobile mechanics laboratory, routine automobile maintenance, and information about the French automobile industry. The original plans of the teachers were to involve automotive students in the economic issues and design lessons. The plans were modified when the automobile mechanics teacher left the research project because of numerous teaching conflicts. After his departure, several advanced automotive students acted as peer tutors to small, cooperative teams of French students during the routine maintenance/vocabulary lessons.

The teaching plan included basic automobile vocabulary (parts and maintenance routines) and the verb forms of *pouvoir*, *devoir*, and *vouloir*. In the automotive shop, the students worked in teams to attach vocabulary words to an automobile with adhesive tape. A second shop exercise emphasized recognition of specific automobile parts, especially the suspension system.

The teacher created and edited a videotape of French advertisements for automobiles. She also developed several lessons about the French automobile in relation to proposed 1992 trade regulations for the European Community. Students learned about the competitive advantage of trade restrictions and the unique suspension system of the Citroen.

Key factors:

In an unlikely or unusual collaboration like this one, there is a risk that students might end up with "watered down" French and automobile mechanics. Because of the thoughtfulness, flexibility, and preparedness of the teachers, this did not happen. During the previous summer, the French teacher researched the French automobile industry at the library and contacted the major French companies for information. By utilizing the advanced automobile mechanics students as peer tutors in the cooperative learning groups, the importance of routine maintenance skills was assured.

Frisbee Golf Course Feasibility Study

Applied Mathematics teacher with Business Management teacher. Students were in grades 10 through 12. At this high school, Applied Mathematics fulfills one year of the mathematics graduation requirement.

Over a two week period a correlated curricular unit was taught in two applied mathematics classes and two business management classes. The applied mathematics teacher invented a Frisbee Golf Course Feasibility Study unit for the classes. It emphasized statistical applications and analysis. The unit included new material and some new teaching methods for objectives from the regular curriculum. Each teacher worked with his own classes but carefully correlated the work of the feasibility study between the classes.

Students collected two types of data. Using a frisbee accuracy range (constructed by the mathematics teacher), students collected data from many different types of trials (i.e., distances, angles, left/right handed, age, grade levels). They also developed a market research survey for fellow students to fill out. All of the data was entered into the spreadsheet, database, and graphic functions of AppleWorks®. The mathematics students were responsible for understanding the statistical concepts. The unit also reinforced accurate spelling. The students were expected to learn to spell ten words commonly used in statistics.

The business management class helped with analysis of cost and estimated the numbers which might participate in frisbee golf. As a unit examination, each business management student prepared an impact statement which was presented to classmates and video taped.

Key factors:
Careful preparation for this correlated unit of instruction was the major factor which facilitated successful student learning. Both teachers committed a good deal of time to preplanning discussions about their own subject matter in order to find matching complementary objectives. This type of preplanning discussion was important and helped enrich the general education for the students.

Protein Distribution: Using Percentages

Collaboration was between the Home Economics Foods teacher and a General Mathematics and Science teacher. Students were in grades 10 through 12.

The overall goals of this eight day correlated unit of instruction were for students to learn more about protein content in meats, percentages in mathematics, and gain a more critical understanding of global protein distribution for the world's population.

Using a protein distribution exercise, the students calculated percentages of population, land, money, and food distribution per continent and country. Then they moved into the home economics laboratory for the scientific experimentation and application of protein percentages. Using beef, pork, and turkey, the students measured fat and protein content to learn more about health, nutrition, taste preference, and equitable distribution of protein. Finally, each meat type was used in preparing a barbecued meat recipe. All students took a taste test and recorded a preference. Accurate computation and interpretation of percentages was taught and emphasized by both teachers throughout the unit.

Key factors:

Several important factors allowed this collaboration to successfully combine mathematics concepts; science processes and equipment; and food science concepts, activities, and equipment. The teachers utilized the most appropriate facilities in the high school including the mini-auditorium, the foods laboratory (microwave ovens were better for cooking than Bunsen burners; less water vapor would be lost so measurement of water and fat percentages would be more accurate), and classroom style desks (the teachers felt the students were more serious mathematics students in desks). Students from both classes worked in small groups. The foods students provided the group with laboratory experience; the mathematics students provided the percentage expertise.

World History Mural

Social Studies teacher with Art teacher. Students were in grades 11 through 12.

A room-sized history mural resulted from this "silver-lining" project. Originally intended as a history of transportation collaboration between social studies and a vocational subject, the project was forced to change when scheduling and time constrained access to the vocational education teacher.

What resulted from conversations between the teacher, the research team, and the art teacher was the opportunity to create a research based depiction of major world history events—those which had influenced western civilization. Students were organized into small work teams based upon their interest in research, planning, or production. These groups designed a mural for one entire wall of the classroom. The corresponding unit of instruction was about the significance of the mural's elements to world history. The actual painting of the mural was to be completed after the end of the research project as it took some time to prepare the wall surface, requisition the materials, and organize the student workers.

Key factors:

We learned two important lessons about collaboration from this project. First, we learned that not all collaborative ideas will become actual lessons; there was a need

to be open-ended. The other lesson we learned was how critical it was for the school administration to support new ideas and new risks, even when those ideas and risks come without guaranteed results.

Analysis of the Educational Interventions

The second section of this report presents an analysis of interventions. The analysis was done at three different levels to give some idea of how the interventions related to one another and how they actually involved the purposes of the project. The participants provided their general plan of work, lesson plans, and instructional materials for us to analyze. We also used data from our observation notes.

Subject Collaboration Among Vocational and Academic Teachers and Counselors

The first level of analysis, showing the collaboration that occurred between vocational and academic teachers, enabled the relationships among subject areas to be seen more clearly. There are many different approaches to integrating vocational and academic education. Based upon different perceptions of the high school's goals, students' needs, and experience with interdisciplinary teaching, the decision concerning which approach to use belonged to the teachers and administrators who carried out the interventions.

In Table 1, each entry represents an intervention involving collaboration between at least two teachers at one of the pilot sites. Interventions are referred to by a keynote or theme name. For example, the intervention involving applied mathematics and business management is called "Frisbee Golf Feasibility Study." A more complete description of each project is included in the preceding section of this report.

Problem Areas of Vocational Life Addressed by Interventions

The second level of analysis shows which of the problem areas of vocational life were addressed in each of the interventions. These problem areas are presented earlier in this report. The teachers were encouraged to develop lessons representing the full range of problems in the proposed conceptual framework for the vocational education subject matter. Vocational life was characterized in terms of work life and family life. As indicated

in Table 2, projects which explicitly addressed this purpose by including problem areas from family life are represented by the "F." Projects which included problem areas from work life are represented by the "W." A project which addressed several of the problem areas such as the ACME Crew represented a richer intervention and greater opportunities for student and teacher learning.

Examples of Problem Areas of Vocational Life Addressed in the Interventions

The previous table indicated the problem areas of vocational life addressed in the project interventions. Table 3 shows examples of the specific problems from work and family life addressed in the interventions. Curriculum which begins with these problems and "backs into" the academic disciplines for more understanding is characteristic of the proposed framework for the subject matter of vocational education and the relation of this subject matter to academic subjects (for a complete description of how this happens, see Copa & Tebbenhoff, 1990).

Approach to Integration of Vocational and Academic Subjects

The third level of analysis, integrating vocational and academic education, draws on NCRVE's work, *"The Cunning Hand, The Cultured Mind": Models for Integrating Vocational and Academic Education* (Grubb, Plihal, Davis, Lum, & Morgaine, 1991), and as extended in *Integration of Vocation and Academic Education: Theory and Practice* (Plihal, Johnson, Bentley, Morgaine, & Liang, 1990). Using these works as a base, the theoretical approaches to collaboration that took place in the various project interventions are described and classified (see Table 4).

As Plihal et al. (1990) explain, reinforced curriculum typically uses supplemental materials in short, intense lessons as a way to remediate or enrich the content of an existing class. Including biotechnology tissue cultures in agriculture reinforced the curriculum in this way. Correlation refers to the simultaneous effort by two or more teachers to encourage student understanding by making connections between subjects more explicit. This approach retains the usual divisions of subjects and could be seen in the Frisbee Golf Feasibility Study. In that instance, applied mathematics students developed statistical tables and graphs while business management students analyzed the same information for feasibility. A fused curriculum results when a new subject is created from content,

materials, and applications for two or more courses. If a food science course emerges from the collaboration of teachers in home economics (foods), general science, and mathematics, it would be an example of a fused curriculum. Broad field curriculum is a synthesized branch of knowledge, building on a number of content areas and related to a common goal. The ACME intervention which involved home economics, industrial technology, economics, and guidance has the potential to evolve into a broad field curriculum which might be called work readiness. The fifth approach, the core curriculum, is typified by its problem-centered approach. Subject matter in a core curriculum organizes knowledge and learning according to the problems which are identified by either the teachers or the students; the ACME project was built on a problem which was preplanned by a teacher.

Potential Change of Approach to Integration of Vocational and Academic Subjects

The choice of a theoretical approach to integrating subject matter could have been different for each project. The teachers chose a theoretical approach according to what made sense in terms of their assigned classes, schedule, and knowledge of each other's objectives. When the interventions were completed, the teachers had new insights, raised different questions, learned more from and about their students, and created ideas for the "next time." From this we learned that one important characteristic of integrated curriculum is its dynamic quality. It is likely to change in approach in subsequent iterations. For example, the Protein Distribution project could possibly become a fused curriculum for food science. Reinforcing curriculum between agriculture and biology may result in a fused curriculum for sustainable agriculture. The success of a core curriculum based on a preplanned problem such as the ACME project, could encourage development of a broad field curriculum for work readiness (see Table 5).

Table 1

Subject Collaboration Among Vocational and Academic Teachers and Counselors

	Academic Subjects				
Vocational Subjects	**English**	**Mathematics**	**Social Studies**	**Science**	**Second Language**
Agriculture				Biotechnology and Ground Water Quality	
Business		Frisbee Golf Feasibility Study			
Home Economics		Protein Distribution	ACME Crew		Families: Multicultural Perspectives
Industrial Technology	Academic Technology	Academic Technology	ACME Crew		French Automobiles
Career Guidance	Career Resource Guide		ACME Crew		
Other			World History Mural		

Table 2

Problem Areas of Vocational Life Addressed by Interventions

Interventions[a]	Problem Areas of Vocational Life						
	Understanding vocational life	Rights responsibility in vocational life	Relationships in vocational life	Technology in vocational life	General vocational life competence	Specific vocational life competence	Managing vocational life
Acme Crew Microsociety	W	W	W	W	W	W	W
Protein Distribution with Percentages		F	W		W F	W F	
Academic Technology	W		W		W	W	
French Autos: Vocabulary and Economic Issues				W F	W	F	
Water Quality and Biotechnology				W F	W		
Frisbee Golf Feasibility Study	W				W	W	
Families: Multicultural Perspectives	F		F		F		
Career Resource Guide	W				W		
World History Mural					W	W	

Note: W = work life context; F = family life context

[a] Arranged from top to bottom in order of decreasing number of problem areas of vocational life under attention.

Table 3

Examples of Problem Areas of Vocational Life Addressed in Interventions

Interventions[a]	Understanding vocational life	Rights responsibility in vocational life	Relationships in vocational life	Technology in vocational life	General vocational life competence	Specific vocational life competence	Managing vocational life
Acme Crew Microsociety	Experiencing unemployment	Understanding implicit job duties	Getting along with a diverse team	Cost of lesser quality product Enhancing a menial job	Flexibility Problem solving Presentation skills	Shelf production Sales and marketing nights	Plan and manage ACME after school and
Protein Distribution with Percentages		Equitable sharing of	Teamwork in laboratory		Percentages in food Decisions about food choice	New recipes Food safety	
Academic Technology	Accomplishing purposeful tasks		Working with diverse populations		Geometry for CAD Current reference skills	Business letters Computer design	
French Autos: Vocabulary and Economic Issues			auto jobs	Loss of to achieve Lower family income	Teamwork maintenance accuracy	Routine auto 100%	
Water Quality and Biotechnology				Water conservation Risks of genetic engineering	Science of quality and genetic engineering	water	
Frisbee Golf Feasibility Study	Amount of preplanning for new businesses				Statistical uses in business	Performing market research and test products	
Families: Multicultural Perspectives	Differing family values and attitudes		Dysfunctional family relationships		Gathering family histories		
Career Resource Guide	Exposure to community professionals				Interviewing Resumes Phone skills		
World History Mural					Teamwork to accomplish a project	Producing wall mural	

[a] Arranged from top to bottom in order of decreasing number of problem areas of vocational life under attention.

Table 4

Approach to Integration of Vocational and Academic Subjects

Intervention	Reinforced	Correlated	Fused	Broad Field	Core
Career Resource Guide	x				
Families: Multicultural Perspectives	x				
French Autos: Vocabulary and Economic Issues	x				
World History Mural	x				
Water Quality Biotechnology	x				
Frisbee Golf Feasibility Study		x			
Academic Technology		x			
Protein Distribution with Percentages		x			
ACME Crew Microsociety					x

[a]Arranged from top to bottom in order of increasing intensity of integration.

Table 5

Potential Change of Approach to Integration of Vocational and Academic Subjects

Intervention	Reinforced	Correlated	Fused	Broad Field	Core
Career Resource Guide	x				
Families: Multicultural Perspectives	x				
French Autos: Vocabulary and Economic Issues	x				
World History Mural	x				
Water Quality Biotechnology	x———	———	———>		
Frisbee Golf Feasibility Study		x			
Academic Technology		x			
Protein Distribution with Percentages		x———	———>		
ACME Crew Microsociety				<———	———x

ASSESSMENT

This section of the report will deal with an assessment of the interventions. The interventions were conceived for the purposes of trying out a new framework for the subject matter of vocational education and increasing collaboration between vocational and academic teachers. The assessment focused around a series of research questions which were developed at the training sessions in cooperation with the participants at the two pilot sites. Participants were asked to think about research questions. If the questions could be answered, the answers themselves would prove that the interventions would be good learning activities and, thus, would contribute to a sound education. The evidence was to be of the kind that could be used with policymakers and teachers in other schools who might be interested in trying out similar kinds of interventions in their classrooms. At the training session, teachers, counselors, and administrators were asked to work individually and develop a set of questions that were important to them. These questions were shared with the group and edited in the process. At each site, separate lists of research questions were developed. Following the training sessions, these separate listings of research questions were combined into one set; in many cases, there were similar questions being asked. The composite list of questions was then shared with the personnel at both of the sites. At the September meeting, the educators were asked to take a look at the questions and see if they had any particular concerns about them. At the time the questions were initially generated, we also asked for suggestions as to how evidence might be collected to answer the queries. The information from the two sites was combined to develop a strategy for data collection for each research question.

Research Questions

The following is a composite list of the research questions developed by the staffs of the two sites in cooperation with the research project staff:

1. What were the effects of the interventions on the students?

    1.1. Did the students learn the objectives of the units of instruction?

1.2. What new things—process and/or subject matter—did the students learn because of the project (i.e., relationship among courses, new learning activities, better understanding of content through application)?

1.3. Did student attitudes toward school, learning, or each other change (i.e., Were the students more motivated, more involved, more positive; did they "buy into" the program or value other students as teachers?)?

1.4. Did the students see collaboration among the teachers? What were the effects on the students?

1.5. Did the students find some practical benefits to the unit of instruction (i.e., in work or family life, other)?

2. What were the effects on teachers?

2.1. What was the nature of the unit of instruction designed for this project? How was it different from the past as a result of the project?

2.2. What new things did teachers learn because of the project?

2.3. At what level of content sophistication can collaboration be successful (i.e., all levels of mathematics courses)?

2.4. How have lines of communication among teachers changed?

2.5. Did attitude toward teaching colleagues and students change (i.e., enthusiasm for teaching, involvement in teaching, positive feelings)?

3. What was the effect on administration?

4. What was the effect on the school as a whole?

4.1. How extensively were staff involved in projects (i.e., number of teachers, counselors, administrators, students)?

4.2. Did the project result in a different mix of students in some courses, or classrooms, or areas of schools?

4.3. Did the project change (improve) the image of vocational courses? Academic courses?

4.4. What effects did student learning have on overall school goals and initiatives (i.e., increased test scores, decreased number of failures, decreased drop out rates, increased attendance, decrease in apathy, increased assurance of mastery with at-risk students, student growth and development)?

5. What was the effect on the community?

5.1. How extensively was the community involved?

5.2. Did the attitude toward the school change (i.e., level of intent, positive feeling, level of support)?

6. What logistics or characteristics of the school system served as facilitators or barriers to project purposes (i.e., department structure, funding, time for joint planning, course scheduling, number of teachers involved)? How can obstacles or barriers be overcome?

7. Should the project activities be continued?

7.1. What could be changed to improve the project purposes and approach?

7.2. What are possible funding sources for future projects?

As can be seen from a review of the research questions, the questions were divided into who was going to be affected—students, teachers, administrators, the whole school, and/or community—and then secondly, into specific areas within each group concerning the potential effects to the participants.

Strategy for Collecting Evidence

The second area of attention to the research questions was the strategy for collecting evidence to answer the questions. Here, thought was given to the kind of data, from whom, when, and how it should be collected. The strategy that was developed is presented in Appendix 4, "Overall Research Questions and Data Collection Strategy." This

strategy formed the basis to develop a set of data collection instruments and lists of other materials that we wanted to obtain from each of the educators in each of the sites. The instrumentation included questionnaires to students, interview protocols for teachers, and journal formats for teachers to keep as they implemented the intervention in their classrooms. A set of the data collection instruments can be found in Appendix 5.

In keeping with the interpretive approach to research, the research team became an integral part of the strategy. The researchers assumed the roles of observers and reflective listeners with the administrators, teachers, counselors, and students throughout the interactions. As observer and listener, we were able to gather together a large amount of empirical information for subsequent analysis and reflection. The conclusions which we offer the reader appear within the context of the research question, often in the actual words used by the students, teachers, counselors, or administrators.

During the months as collaborative researchers with the practitioners at Humboldt and New Richmond High Schools, we learned more about the nature of the university/school relationship. We had intended our role to be that of observer and listener, yet, when looking back upon the interactions, Professors Beck and Copa were able players within the role design. For the third member of the team, research assistant Ginny Pease, the role of observer/listener/colleague evolved during the project. Ginny Pease was the contact person for the administrators and teachers. As contact person, she communicated on a regular basis with the participants; she was on-site at the schools for all of the observations; and she was involved as an interviewer with the students and participants. At times, discussions with a teacher or administrator called for an active response from her that would mirror the response style of a colleague or friend. Our interpretive research methodology did not limit us to one role or the other, but it did challenge us to be conscientious and self-conscious role players. Our heightened awareness of the nature of our roles in the collaboration was considered during the analysis of our data.

Analysis of Evidence

In the following two sections, the data gathered by the various strategies noted above was analyzed and brought together to provide two different forms of responses. The first effort was discovering meaningful answers to the research questions. We attempted to

describe the teachers', administrators', and students' ideas and beliefs in the answers to research questions. In order to answer questions one through seven, the research team followed a multistep process. First, our audiotapes and field observation notes were put in a print format. The tapes of all of the interviews with teachers and students were transcribed and the observation notes typed. All of the data items were identified according to intervention.

Second, we gathered into separate files all data pertinent to each intervention such as the General Plan of Work, the lesson materials, notes, and interview materials; these were then thoroughly read by each member of the research team.

In the third step we developed a matrix of responses to each research question and its subsections. Using the first question as an example—"Did the students learn the objectives of the unit of instruction?"—we searched for answers from students, teachers, and administrators. The answers we found were typed into a database using identifying codes for each source. The matrix was printed on continuous form paper, organized by question number, and taped to our office wall.

Our fourth step was the task of understanding the responses to each question and expressing the meaning in summary form. We did this as a team for the five sub-points for question one. At that point, when we felt that we were interpreting the evidence in a consistent way, Ginny Pease was assigned the task of completing the analysis for questions two through seven.

The fifth and last step in this process involved the whole team again. Each member read the preliminary answers for the research questions. This was followed by discussion, rewriting, verification of quoted passages, and a final response version.

Our second effort at analysis, beginning on page 71 in the next section of this report, is entitled "Beyond Conventional Research Questions: An Interactive Analysis." It is the result of the "reflective turn" (Schön, 1991) taken by the research team. After the interventions were analyzed and the research questions answered from the perspective of the collaborators, we were led to reflect on our own understanding of the findings of our research. This second effort developed during communications among the research team about our own understanding of the project's purpose and the participants' actions and

discoveries. We reflected on what was learned that could be immediately useful for the project's, and other, practitioners, as well as, ourselves and other researchers doing similar work. As Schön (1991) points out in his explanation of the dilemmas of reflective practice, "When we have taken the reflective turn, what constitutes *appropriate rigor*?" (p. 10). He suggests that appropriate rigor combines the concepts of validity and utility. Validity is established through analyzing the right sorts and amounts of data in search of some notion of truth. The reflective turn also brings in a requirement that our study of practice be useful to those we study. These two issues, validity and utility, resulted in our second effort in the analysis of the evidence.

Conventional Research Questions: An Analysis

1. What were the effects of the interventions on the students?

1.1. Did the students learn the objectives of the units of instruction?

Student learning which would have likely occurred without the project intervention is as follows: (1) discovering additional depth of subject matter (i.e., to comprehend family patterns and values in varied social, cultural, and historical settings; to discover and use current technological reference materials in graphic arts); (2) making connections between subject matter (i.e., to identify an automobile suspension system and to recognize the economic importance of an innovative suspension system to French trade); and (3) recognizing new subject matter in vocational education (i.e., to practice teamwork in decision making, quality control, and production; to perform biotechnology tissue culturing; to examine ethical dilemmas involved with world protein distribution).

A second way to sort student learning is in terms of the source of learning. In this scheme, learning could be sorted into (1) learning from the discipline's content (i.e., to gather, compile, interpret, and display data in a statistically sound way; to identify the basic processes used to treat water or sewage) and (2) learning from the process of instruction (i.e., to understand

the work-related concepts such as cooperation, communication, and system; to generate ideas to solve a company's problems).

Participating teachers said the students had reached the planned objectives of the unit of instruction. When asked, most students agreed with this conclusion. It was important to ask, both the teacher and the student, "What did the student learn?" and to do so in multiple ways. Asking only one or the other did not give us as complete an answer. On a written student evaluation form, some lower ability students wrote that they learned "nothing," which some might view as *not* an uncommon response from high schoolers in required classes. But, with further questioning, these same students wrote that they had "learned the content well." They had also done well on the unit quiz according to the teacher.

We noted that students tended to say they had learned the objectives which their teachers had emphasized, even though during the observations much other valuable learning was taking place. Teachers were also aware that "other good stuff" happened.

1.2. What new things—process and/or subject matter—did the students learn because of the project?

Students in classes where the interventions were made experienced a richer general education and a different vocational education. Students said they learned the following new things as a result of the interventions: (1) a new slant on technology (i.e., Macintosh computers, under the hood skills, wood production, food laboratory skills); (2) increased depth of a subject (i.e., biotechnology); (3) more critical perspective (i.e., local groundwater quality); (4) connections (i.e., green turf from chemical use and chemically polluted groundwater; the competitiveness of the French automobile industry and Citroen's innovative suspension system); and (5) personal relationships (i.e., learning to work with somebody previously disliked; other students as teachers).

The number of "new things learned" mentioned by the students appeared to be influenced by the teacher's methods, materials, and decisions about what

to do. If collaboration could be categorized as "lean" or "rich," with rich implying greater involvement of teachers and students, students from the rich collaboration projects mentioned the most "new things learned."

1.3. Did student attitudes toward school, learning, or each other change?

The interventions resulted in new and different lesson formats. These formats were mentioned by the teachers as reasons for a positive attitude change. High student interest was sometimes exhibited as extended and sustained effort. For academic students, the chances to participate in the automotive shop, use the graphics technology, or scientifically experiment with the equipment from the foods laboratory were motivating. There appeared to be a connection between enthusiasm and technology.

Students from academic classes told us they had become more aware of the vocational laboratories. We asked them if their image of vocational and/or academic classes had changed because of this project. Interestingly, students did not seem to understand what was meant by "vocational" or "academic" classes; they acted unsure about what we meant by "image change." We discovered they could more easily talk about "required" and "elective" classes. It seemed that we lacked the words to communicate with the students concerning the nature of this research question.

Our frustration with this question caused us to also wonder about the kinds of classes which collaborated. Did it make a difference if the class was required or elected? In these interventions, the teachers most often combined an elected vocational class with a required academic class such as mathematics, science, social studies, or language. If collaboration had occurred between two electives, what kinds of attitude changes would students experience? When there was an increase in enthusiasm in academic classes, was it because of the material, the technology, the teaching method, or the teacher? Would interaction between two vocational classes generate the desired richness of subject matter?

1.4. Did the students see collaboration among the teachers? What were the effects on the students?

The students' perception of their teachers working together was astute and accurate. Students' anecdotal descriptions of teacher collaborations during the interventions mirrored the descriptions offered by the teachers themselves. This was true even when their teacher acted in a new role (i.e., general mathematics teacher as cook, foods teacher as mathematics teacher, gifted and talented teacher as resource person to graphic arts). What was even more impressive was that the students not only perceived accurately what they saw, they learned from it. What teachers do is a very powerful lesson. For example, the ACME Crew members noticed that their consultants/teachers were learning new things. During the exit interview a student described one experience:

> Well, just a while ago, one group had problems getting their things done, so they wanted more people [to help]. Students were getting mad at teachers, and it seemed like the teachers were getting mad at each other. We didn't talk for so long, and we all had our different goals, our different views how things should be done. And we didn't, like come together and say "OK, what are we going to do?" But the teachers, they sat down and talked about it, and now everything is fine. You just got to talk about it.

Students learned about ambiguity. They saw teachers without all of the answers and realized that they were learning to deal with real problems. A teacher said it this way:

> One of my goals in terms of what we can be doing with contemporary education is to put these kids into an unstructured situation, because we don't know what the future is going to be. That is what we tried to do with our collaboration. We tried to anticipate some of the problems, but we can't anticipate all of them. And then, maybe we shouldn't. A lot of frustrations are real, and some of the kids have some of the same frustrations, but they are real frustrations, and it's exactly these kind of situations that those people in the future will have to deal with, and so in that respect, maybe this is very good.

We had originally assumed that collaboration would benefit all teachers. One student's comments caused us to wonder if collaboration could cause a teacher to be perceived as "needing help." This student said:

> If I was a teacher, let's say I'm a reading teacher, I would definitely not want a social studies teacher coming up to me and telling me, "Hey, why don't you try this?" I mean, I can handle a suggestion, but telling me to do something . . . I couldn't do that . . . so I don't think a lot of teachers would do this [collaborate].

Additionally, a teacher said, "I wonder how the students perceive me?" These comments led us to question whether students could perceive collaboration to be strength plus strength (a synergistic relationship) or strength plus weakness (remedial relationship) among the teachers? Does collaboration make a positive statement about both teachers? Should it?

1.5. Did the students find some practical benefits to the unit of instruction?

Students talked hesitantly about the practical benefits of what they had learned during the collaborative projects. The benefits were for two time periods: (1) today (i.e., learning new recipes to use for the family, learning how to check motor oil, making interest surveys, turning off the water to conserve it, practicing teamwork, getting along for a shared outcome), and (2) in the future (i.e., using tissue culturing at a job, writing a business letter, finding an article in a technology magazine).

Students had difficulty finding and using words to answer the question about "practical benefits." We noticed a real interest and concern among the students for this part of their interview. But they were not easily able to recognize what they had experienced, nor were they able to make connections to their broader life interests. If the teacher helped them talk and think about practical benefits, the students were more articulate with their answers.

2. What were the effects on teachers?

2.1. What was the nature of the unit of instruction designed for this project? How was it different from the past as a result of the project?

The two goals of instructional interventions in this project were (1) to create a richer general education, and (2) to expand into new areas of the subject matter of vocational education. Decisions about the objectives and content of the instructional interventions were made by the teachers. The researchers suggested two parameters to guide these decisions. First, the unit of instruction should "make sense" to the teacher in terms of their curriculum and teaching assignment. Second, collaboration should be between vocational and academic subjects at minimum, but could also include counselors and other staff.

The teachers said that their units of instruction were different from the past in two ways. Some teachers said that it was new content:

> This is all new to me. I did library research this summer about the French auto industry.
>
> [I did] abstract geometric concepts in a design project on Macintosh computers.
>
> This was the first time I'd done biotechnology tissue culturing in the class. I just picked up some of this material in summer school.

Teachers ventured into new areas with the support of their colleagues.

The second way the units of instruction were different was the way in which the material was organized and presented. Teachers noted the following:

> I had taught groundwater quality before, but never with the water conservation people as resources.
>
> Some learner outcomes of wood technology were the same, but the route to getting there was totally different.
>
> I had never taught these reference skills in Industrial Technology before.

> This is all new; it was modeled after resource guides from other places.

Deciding on a unit of instruction was not always easy, as we discovered:

> I found that I didn't know the curriculum of the vocational areas, so I didn't know where math fit in and would be usable.
>
> I didn't realize that my geometry students were not ready to use the computers in the graphic arts lab.
>
> We didn't have the time to develop this unit the way we would have liked.
>
> Our schedules did not mesh well.

The teachers realized that the interaction between two or more specialized curricula resulted in gains—that is, new ideas for themselves as well as for the students. Collaboration resulted in enriched general education for teachers and students; each learned more about their areas of interest. Collaboration was not a zero-sum game, with rules that state if one teacher teaches percentages, a second teacher loses the right to teach it. Rather, relating information from academic classes to real situations in the vocational classes resulted in "ah-ha!" experiences. From the ACME Crew intervention, in which economics, consumer economics, and wood technology teachers and students interacted, the wood technology teacher pointed out the following:

> There weren't too many kids talking about marginal propensity to spend, but the kids had to estimate how many shelves to build. I said to one kid, "This is what that is all about." The [economic] concept made more sense.

2.2. What new things did the teachers learn because of this project? Teachers in this project learned new things about high school students, limitations of the high school structure, the qualities of colleagues, and how to continue with collaboration in their schools. A teacher told us, "I learned, actually reaffirmed, that high school students are the same everywhere." For one vocational teacher, opening a window into the classrooms of other teachers showed him that, "They don't have it so good

either. [Students] have no stronger feeling for a required class than they do for mine."

Even the best collaborative plans sometimes went awry because of the current structure of the high schools. One of the most innovative teaching teams described what happened when they saw their teaching schedule before the opening of the Fall semester:

> You can attempt to plan on teaching something [together], and all of a sudden find out that everything has been changed. We came over to school to look at our assignments, and . . . out of the seven periods, we didn't match one hour. I came in and said, "Hey, we need to match at least one hour with the two of us." We got it, but . . . there again, it throws everybody else off.

The limitation of the traditional seven period day was also obvious to the administration. One administrator commented,

> This is an interesting situation. It is possible that in a smaller school, like ours, you're not as rigid as you are in a [larger] school. You can work things out easier. You're dealing with maybe one teacher who has control of a given subject versus several teachers. I think it is a lot easier to do the arranging. The other side of the coin, in a larger school . . . you can plan on things a little easier than you can here. Now that's because of the problems we have with size and singletons. . . . In a larger school they know months in advance what they are going to be teaching. It's a more rigid schedule, and you can plan it. But, you also are more rigidly bound to that. It's much more bureaucratic; it is much more difficult to do things.

Teachers learned more about their colleagues:

> Teaching with other teachers was different than collaborating with community people. It is important to know each other's strengths. I learned that matching up two creative types may not be good; in our case, she was task oriented, and I am more creative—it worked well.

> I realized there were differences in teaching philosophy we may have to face. There are benefits to having both the same and different philosophies.

The teachers also learned that they could work across areas in which they did not think it was possible.

As the teachers looked to future interaction, awareness of new lofty and practical concerns increased. One teacher commented,

> I'm feeling again the limits of what we can do in a high school time setting. Sometimes all we can expect is to light the fire—we don't necessarily get to blow on it, rekindle it, or even admire it.

A different teacher said, "Students in Home Economics need to be in desks. This class is just as academic, but tables suggest this is less serious."

2.3. At what level of content sophistication can collaboration be successful?

During the summer project training, several teachers wondered if collaboration could only be successful with certain levels of subject matter content. For example, would this only work in general mathematics, or could we expect collaboration to improve calculus? After the fact, the teachers agreed that the level of content was not a factor for successful collaboration. The projects involved most areas from vocational and academic education, and students who were "the cream of the crop" and "severely disabled." Earlier doubts of two mathematics teachers were dispelled:

> English grammar and critical thinking skills were important in Home Economics too—yeah!
>
> Ag and biology have a lot of overlap; there is a lot more we could be doing.
>
> I combined poetry writing and therapeutic counseling—it was wonderful.

After teaching the Family Studies class, the French teacher said, "It went well."

The teachers were able to collaborate with all levels of students and content when the students were prepared for the new material or a different teaching

approach. Vocational teachers tended to take for granted the laboratory skills of their students. Academic students with no vocational laboratory training were not ready to fully participate in laboratory work in safe ways. In the future, these teachers said they would check for prerequisite knowledge. Several teachers of academics suggested that they would prepare their students for active, hands-on learning ahead of time:

> They were quite resistant in the beginning to the change.
>
> Our frisbee throwing experience did not yield the data I had hoped; it was a bit unruly.
>
> The science students need to get out into the community more, but we have to work on field trip behavior.

2.4. How have lines of communication among teachers changed?

Within the two high school sites, the lines of communication changed significantly and forever for the collaborating teachers:

> I feel less isolated.
>
> We have new things to talk about with other teachers.
>
> I have a better idea of what others are doing.
>
> Science and Ag got together; it wasn't that way before.
>
> When I first came upstairs to the Math Department, they asked me what I was doing there. Now they are used to seeing me.
>
> I cleaned the mud off of my shoes and headed to the science wing.
>
> Before, I would have stayed in my room and graded papers, but now I walk down to his room to talk about our work.
>
> The math teacher knew of some computer programs which I didn't know about. We may need these in Industrial Technology to fit new needs.
>
> Our administrator learned some things about our classes he didn't know before. It was important for him to be involved.

Constraints to good communication were also noted. After the project, teachers said,

> Communication skills became even more important for us. We may need help saying things to each other that we want and need to say.
>
> To do this takes TIME.
>
> Time was a factor.
>
> A lot of other teachers asked questions.
>
> There was a lot of curiosity about what we were doing. We should have talked about this project to the whole faculty ahead of time.

2.5. Did attitude toward teaching colleagues and students change?

During exit interviews with the teachers, we heard how attitudes had changed toward teaching colleagues and students in terms of renewed respect, empathy, and personal growth:

> We're like sleeping giants. Look what we can do when we wake; how meaningful this can be. We can work miracles with the right support.
>
> It's frustrating to know what we could do but the reality of school prevents us from doing it.
>
> I say YEAH; it's not just us anymore!
>
> Just knowing that another teacher exists who is just as concerned with my outcomes as I am was great.
>
> He is a very cooperative teacher who can handle just about any type of situation with lower ability students.
>
> I'd like to know more about the vocational curriculum before I do this again; maybe a curriculum coordinator would help.
>
> My goal is a food science course for academic credit. I'd like to work with her again.

Teachers talked freely about their students as fellow learners within the project. Collaborative learning encouraged the teacher-student collegial relationship:

> I really want to communicate with and listen [more] to my students processing this experience to see if my perception is close to what I am hoping they are getting from this experience.

The respect for students was also obvious:

> Some of the student leaders are kind of outlaws in the school; I was very impressed by the responsibility and enthusiasm displayed by these students in the core leadership team.
>
> Students who took leadership roles in the project were not necessarily the ones who always have the leadership roles in this school.
>
> Higher level students belong in vocational education. It is important that students have useful, marketable skills and show initiative and innovation. Students in academic courses may not have sufficient opportunities to do this. Vocational education does this.

How will these attitudinal changes affect the future in the pilot sites? New respect, empathy, and increased collegiality will increase the opportunities to address some of the questions raised by these teachers:

> We need to reevaluate how quickly we want to cover the material. Do we want to cover or uncover concepts?
>
> This is so exciting for some kids; some think it is their job. How do you turn it off?
>
> This project made me think a bit more about attitudes that need to be changed. We should be using more vocational curriculum for reading, writing, and thinking skills. Kids need reasons to read in their areas of interest; not remedial education. Vocational education will not welcome me with open arms right away, but I will work on it, one teacher at a time, one small project at a time.
>
> Kids are asking real questions.
>
> It will be hard for some teachers to let go, and let kids seek and discover knowledge.

3. **What was the effect on administration?**

This pilot work involved three administrators. Two were veterans; they had long standing relationships with their schools. The third administrator had previous administrative experience but was new to the pilot high school. All three were extremely effective and influenced the success of this project.

We learned that there were both effects on administrators and effects of administration. The administrators learned that cooperative teaching and learning can go on across many disciplines: "I just hadn't thought about vocational and academic before." There were stresses and strains on the schedule as the teachers worked to collaborate. And others in the building needed to adjust to some of the new movements of students and teachers since it was not like it had been. They worried about keeping up the intensity of effort and enthusiasm going into these projects, as some teachers felt the need to focus and pace themselves more than others.

The administrators were very aware of the effects of their support for collaboration. All three seemed to agree that the teachers were a bit hesitant in the beginning: "[they] wondered if they could do it." They supported teachers and trusted their ability to turn somewhat vague research ideas into concrete units of instruction. They encouraged risk taking and accepted failure without blame. They realized that teachers needed openness and freedom to try new ideas. These administrators also told us that they had the support of their district supervisors in taking risks.

The harmony between this project's goals and each high school's goals became apparent as we listened to the administrators. The goals and activities of the research project exemplified the goals which they held for their schools. One high school saw the project as helping them get one step closer to becoming a laboratory school with links to several universities where the best ideas for practice and research are generated. The other high school was able to use the goals of the project as an exemplar of its broader mission statement. These turned out to be "happy accidents."

4. What was the effect on the school as a whole?

At both sites, the administrators made efforts to inform the school staff about the goals of the project by inviting the investigators to meet with the whole faculty at a regular faculty meeting. One result of the meetings was the opportunity for participants to talk with and answer questions from their colleagues.

One participant described how she changed her mind about her intended project. "After talking with [other teachers] I've decided that my idea would be perceived as one more meeting and would be administrative in nature. It wasn't appropriate for now." But, another opportunity arose in the form of a high school mission statement:

> I agree that this common effort would develop some school cohesion and perhaps reframe thinking from segmented "me" thinking within departments to "us" thinking as a school. I gave my principal an overhead to use in discussing the school's mission statement. It is from Lewis Carroll's *Alice in Wonderland*: "Alice came to a crossroads where she met the Cheshire cat. 'Which path should I take from here?' asked Alice. The cat replies, 'That depends where you want to go.' 'I don't much care where,' said Alice. 'Then it doesn't matter which path you take,' said the cat." The mission statement is tied to this; as a school, we need to know what end we are trying to accomplish before we select the appropriate means.

4.1. How extensively were staff involved in projects?

The two pilot sites involved a selected team of vocational and academic teachers, counselors, and administrators. Individuals generally collaborated with a teacher from within the pilot site, but new teachers also got involved. For example, an art teacher offered expertise in visual communication to two projects; a business education teacher joined as a collaborating teacher; a student teacher in agriculture worked closely with the agriculture-science intervention; and the social studies student teacher helped students with research for the mural. Teachers and administrators said, in the future, they would continue to work with these teachers and others who showed interest. One administrator said, "Those who showed early enthusiasm are most innovative, but others can catch this enthusiasm later."

4.2. Did the project result in a different mix of students in some courses, or classrooms, or areas of the building?

Due to the limited time frame for the interventions, mixing and moving students was entirely up to participating teachers. Team-teachers were most likely to mix and move students. They developed new curriculum (as in ACME Crew) or shared curriculum objectives. Several teachers said, "The mix of students was real positive."

Swapping classes, team planning, and acting as a resource teacher were effective ways for teachers to collaborate but did not result in mixing or moving of students. One vocational teacher restructured his teaching day in order to open the Macintosh laboratory during the first hour in support of other teachers; he called this hour "Academic Technology." During our observations, there were college preparatory students working on business letters and severely disabled students writing a newsletter in the laboratory. Both groups benefitted from peer tutoring provided by intermediate and advanced graphic arts students.

One goal, shared by several vocational teachers, was to expose academically tracked students to vocational education. These teachers opened their laboratories, shared their equipment, and worked to attract new students to their classes. Students from academic classes responded positively to the change of pace and instructional style, as well as to the equipment and curriculum.

Generally teachers and students recognized the value of the vocational laboratories. Vocational students did express their concerns about sharing with comments such as, "When do we get our room back to ourselves?" They also protected the value of their programs. One girl commented, "I know all of the talk about [how] the FFA corn drive interrupted the biotech lesson, but it is our important fund raiser. It is important to us."

4.3. Did the project change (improve) the image of vocational courses? Academic courses?

Administrators and teachers were able to answer this question more easily than the students. Teachers were aware of the designations "vocational" and "academic"; students were not aware of these designations, nor what they implied.

The administrators admitted that the images had changed somewhat for them:

> I hadn't thought about teaming this way, but it may be better to do it this way.
>
> Vocational programs will see that they have to cooperate with academics to maintain their programs. Academics will have to look at vocational education and see what they have to offer.

Teachers learned more about what was across the wall which seems to exist between the vocational and academic. They said that it was this new information which caused their images to change:

> I don't know if vocational education has to change; the project only reinforces this. We should be teaching specific skills with real life applications.
>
> It is sometimes so difficult to make connections in math; it was nice that we could do it this way. Vocational subjects can be brought into math more than I thought.
>
> Academic teachers have the same problems we do.

A Home Economics teacher reflected from the vantage point of one who has seen dramatic curriculum changes:

> Vocational teachers have been encouraged to know more about academic content in courses over the past five years. Home Economics has a high regard for academics. Students in family studies accept the new image and academic requirements. They don't grumble anymore when we correct the punctuation or require critical thinking in reports.

When students were asked about the change in image, they appeared to act unsure of what "vocational" and "academic" meant. Examples did not clarify their confusion much. They tended to think in terms of required and elective courses, or courses for "underclass" and "upperclass." The few comments we did hear were from academically tracked students:

> This sounds really bad, but when you take more academic than vo-tech or shop or something, you don't want to be in vocational classes, but once you go down there, everybody down there knows a lot of things. [They] really know so much. It's neat and it makes me want to learn it too. I . . . respect it a lot more now.

With respect to academic students, a boy in vocational classes said, "Boy, what are they gonna do when they have to build a shelf or something like crafts . . . get someone to do it or do it by themselves?"

The question, whether the image of vocational or academic education changed (improved), could only be answered if we understood "changed from what." Students in vocational education all said that they knew about the required classes. Some of the college preparatory students were experiencing vocational education in the high school for the first time. These are different perspectives from which to view change.

4.4. What effects did student learning have on overall school goals and initiatives?

When these research questions were jointly developed during the summer training session, the teachers and administrators challenged us to determine whether collaborative pedagogy would be of value in reaching their school's goals. With the many demands on teacher energy and time, they thought it important to understand how these new ideas would help them accomplish their tasks.

At the exit interviews, the participants at the two pilot sites were in agreement. The student learning they observed in these units was important and in line with their school's goals and initiatives. This was true for the teachers, the administrators, and the counselors. We heard comments like,

> This project is exemplary of our school mission.
>
> It was a source of pride; teachers and kids were interested. Many others asked questions about this work.

A teacher described how this work fits with school goals:

> We have to come to the point where agriculture is science, and science is agriculture. We can be a place where kids learn math for real reasons. It won't happen until teachers work together in teams . . . tear down the walls. The walls are only as tall as they think they are.

Attendance was an effect which was frequently mentioned by the teachers:

> increased motivation of students, without forcing, without doing or over doing.
>
> Everyone came on collaboration days.
>
> Students were more interested in attending school on these days.

Teachers also said that this project helped them achieve their personal teaching goals:

> This was something I really had wanted to do.
>
> It helped me reach my goals, one more tiny step in line with improved test scores, reading levels of the lower quartile of students, writing skills, and library research skills.

This project involved risks for the faculty. There was no reassurance that a collaborative intervention would work: "We were moving in the right direction, but I'm not sure that the school sees it this way. The school support staff was beginning to see our project as a nuisance. Everyone is not well enough informed."

We do need to wonder whether collaboration would help achieve school goals and initiatives in schools with different goals than these two pilot sites. We noticed compatibility between the purposes of this research

project and the goals of the school. Would we have received such positive results had there been a different situation?

5. What was the effect on community?

5.1. How extensively was the community involved?

5.2. Did the attitude toward the school change?

There was not sufficient involvement of the community in the interventions developed within this project to answer these questions.

6. What logistics or characteristics of the school system served as facilitators or barriers to project purposes? How can obstacles or barriers be overcome?

After the educational interventions were over, the teachers were asked about characteristics of the school system which acted as facilitators to the project purposes or as barriers to the project purposes. Our findings were of two kinds. The first were the obvious findings which support the conventional knowledge of educational innovation; the second kind were findings which resulted from the more personal reflection of the teachers.

The most often mentioned facilitating characteristics were administrative support, time to plan collaboratively, course scheduling, and attitude of the participants. These answers are not surprising as they are often associated with educational innovation within schools.

First, every educator in this project stated that having administrative support was essential. The teachers felt supported to take risks, to branch out and try new things, "to accept the risk that I might not succeed." Moving out "on the limb" into an area where "they didn't think they could do it, but they did" deserved administrative support. The teachers felt they had received it. So did the high school administrators. All three principals told us that their superintendents expected and supported innovation and risk taking: "My boss says do things that

will help youngsters. I know I will be supported; our system is set up for us to try new things. 'I can't do it' is not said in the district."

Second, the teachers agreed that time to plan and replan was a big factor in their success. The research project did provide funds to pay for substitutes or extra planning time, but the teachers tended not to use them. Because the interventions were planned during the Fall semester, we found that most teachers did not use substitutes. They conscientiously carried out their full teaching assignments, then, planned for the collaborations after 4:00 p.m., on weekends, or during the previous summer. They would have been more inclined to use substitutes in the spring semester, after the class dynamics and expectations were established.

The high school schedule acted as a barrier to the teacher collaboration. Two interacting teachers who planned an intervention discovered that their students had not been scheduled in the same time slots. The geometry teacher said, "Just for eight teachers, the seven period day results in 256 different scheduled blocks. I never could work it out so I could go with my seventh hour geometry to the graphic arts lab when he was available during first hour. Maybe next year!" Several teachers would have preferred to do their collaborative planning right after the summer training session, but were not certain until the first week of school exactly what or when they would be teaching.

The last obvious characteristic of the school system which seems to "make or break" collaboration was the attitude of the involved individuals. While the teachers agreed that it was important to get the "right people" and start with the people who are most likely to collaborate, it was also suggested that each school include one or two "doubters." Imagination, creativity, and willingness to try were important participant characteristics.

Beyond the obvious characteristics, we learned that successful collaboration also depended upon (1) the "right time" to make the decision to collaborate, (2) the ability to pick the "right people," (3) communication with the whole building staff, (4) the availability of funds and facilities, and (5) tempered ambitions.

First, the teachers told us there is a "right time for new initiatives like this collaboration project." The research team should have made initial contacts and conducted the information meeting in the spring, held participant training in the summer, and expected intervention implementation during the year "when it made sense in the curriculum." For many teachers, early Fall implementation was too soon; the classes had not yet gelled. Later times in the school year would have been better for the interventions and observations.

From the teachers, we also learned that on-going communication throughout the total building staff is important. And, "the word" had to come from the teachers themselves. It was not enough to talk to a fellow collaborator; these teachers learned that there were "many questions from others in the building about our project." "I should have sat down with the hall monitors and aides so they would understand and support what we were doing."

Upon further thought, we realized that "including the right people" in new collaborative efforts meant including both teachers and students. As noted above, a willing attitude and past experience in interdisciplinary instruction were both important facilitators. But we also heard that student willingness to try new things and student background were important to success. One teacher stated:

> At first, students [from Economics] were very resistant to change. I had to get them to buy into the project. They were suspicious and were fighting it. They needed a lot of guidance, especially in a large group setting. But then they got used to it and really liked it.

A mathematics teacher wondered if his teaching results would have been different with different ability students or with students who had elected his mathematics course because of personal interest as opposed to meeting a graduation requirement.

A fourth point of reflection was about availability of funds and facilities. A general mathematics teacher said "we are all vying for student learning time; we have to use all of our facility. It is all right for students to move out of their conventional areas." Furthermore, her Home Economics collaborating teacher said that the vocational funds and facilities should supplement the academic budgets. "We could provide the meat, and we used the foods lab." The vocational laboratory instructors

cautioned that, although they would willingly share, overloading the laboratory facilities at any one time is a big concern. There is less adult supervision, and the students regularly enrolled in the vocational courses felt cheated out of their experience. The administrators in the project appreciated the "risk-taking" funds which the project provided at the outset. Start-up monies let the teachers know that the work was valued and important.

The fifth and last comment about characteristics of school systems had to do with ambition. Remembering that these two pilot sites actively sought challenge, it is important that the teachers recognized that

> [we] tend to be too ambitious in these undertakings.
>
> we get log-jammed.
>
> we wonder how we can sustain this intensity in the long run; how we will shut this thing off?

Tempering their ambitions might be one way to sustain the collaborative efforts over the long term. One principal suggested that he would like the research team to check back from year to year, over the next five years, to help him continue to emphasize to his teachers the importance of the research project.

7. Should the project activities be continued?

After a student interview was completed, the researcher asked "Is there any question you wish I had asked you?" One quiet girl who had spoken little during the formal interview said, "Do you think you are going to continue with these kinds of things in the future?" What she seemed to be asking was, "Is this important?" It was a good question that needed to be asked.

When the teachers were interviewed they had no doubts about an answer. The teachers said the project activities should continue. The results from collaborative interventions were "important." A participant commented,

> The type of learning that went on in the micro-society of ACME and the merger of agriculture and biology are only two of the infinite possibilities out there. I would like to see teams of teachers teaching students. Now we push kids through an assembly line, and our

> good companies don't do business that way anymore. Our school is not in a vacuum and the regurgitation of facts is only good for going on the TV show *Jeopardy*—"I'll take Columbus for $200." That is not real. We need to focus and need to be relevant. We are losing kids even though we have good teachers and enough resources. We could be doing better.

The kinds of activities that happened in these collaborations were also timely and relevant. In response to a comment about preparing students for the future, a teacher realized what had happened in the intervention paralleled what was happening in the town's new business:

> It's right here. It's not out there, and it's not abstract, somewhere over there. It's here, and it's a whole different way of looking at how [people] will interact and enter into the business world. We need kids who can walk into these roles and be comfortable, take a leadership position and see themselves as a member of a team, and know what team concept is all about. The problems that occurred and the rewards that occurred . . . I think the collaborative project allowed some of that to happen and gave the kids a taste of what is real. I think it is great.

7.1. What could be changed to improve the project purposes and approach?

The thoughts of the large majority of the participants were best expressed by an administrator, "The most important thing is to get teachers together to think and plan and dream." With enough time to think, plan, and dream, the "sleeping giant could work miracles."

Specifically, if the research project were to be repeated, the participants suggested three ways to improve it. These suggestions were in addition to the pervading request for time. First, the teachers would have preferred to have been contacted and selected during the spring semester for the following year. Second, they thought we could have made our goals and expectations clearer during the first day of the summer training. The third improvement they suggested was to re-write the general plan of work in a way which would be more useful for them in their work (many of them did this on their own anyway).

As investigators, we reflected on the research questions of the study. As facilitators, we were aware when our efforts fell short of our aim. For those readers who might be interested in trying out these ideas in a local school, we add some suggestions.

We noticed that not every teacher was able to bond with another teaching colleague in the interactive way described later in this report. Were we to repeat our study, we would know to watch for signs of engagement. We would make an earlier effort to pair teachers and suggest ways to start the conversation about their subject matter and their teaching philosophy.

We learned how important it was to mix students from different curricular areas and move students to new areas of the building. We observed that students in some classes were heavily tracked into the stereotypic curricular areas of college preparatory, vocational, and general. Teaching new subject matter in vocational education and collaboration between vocational and academic teachers may not be powerful enough to overcome the limitation of tracking which can relate to enthusiasm, connections between subjects, and practical benefits for life beyond school. Mixing and moving students is one more tool a teacher could use to achieve these results. We would encourage the use of this tool in all of the interactions next time.

The teachers told us, and we observed, that not all students were ready for a vocational intervention. We suggest that academic and vocational teachers identify the prerequisites before bringing students into a vocational experience. Do students know what they would need to know in order to be successful in a laboratory, with equipment, or in a different learning environment?

7.2. What are possible funding sources for future projects?

As researchers, we learned the value of start-up funds, and some things about school budgets. All of the administrators felt that the money provided for this research project by the NCRVE really served as risk management funds. "It helped us try out something new." If the project activities were to be continued in the future, the staffs of both schools felt confident that

funds could be found in the school or community to continue. These funds would be in the form of district instructional dollars, foundation funds, local community partnership grants, and specialized funds such as the monies from the Carl D. Perkins Vocational Education Act.

Conventional Research Questions: A Summary

The research questions dealt with two areas of interest. The first five questions asked about the effects of the interventions on the participants (students, teachers, administrators, school as a whole, and community). Questions six and seven asked about the research project's purposes and activities. Answers to the questions seem to suggest that interaction between vocational and academic teachers resulted in a richer general education, which includes vocational education, for teachers and students. Both groups said that they learned "new things" and wanted the project activities to continue. They had taken advantage of new opportunities in their subject matter, but there were many more opportunities to explore in the future. "I'd like to work with her again and teach a food science course for academic credit." "Next year we'll be working together in the greenhouse." "I wish I had collaborated with a social studies teacher; next time I will."

Assuming the collaboration continues, how would the interventions look in the next iteration? We learned from the teachers that their units of instruction are not static; they are dynamic. The process of interaction was educational in and of itself. A teacher commented:

> My own growth was in the area of flexibility and compromise with my fellow peers . . . [I] learned patience and openness to the idea that even if I may not agree with the process chosen, the process itself can be educational to students and teachers alike. For example, as the management consultant I've been "chomping at the bit" to address issues I see arising in decision making, personnel, power among workers, communication at work, etc. I have the impulsive desire to correct such problems which, in fact, I helped create. [I realize] that the process which creates these problems can better initiate the atmosphere necessary to motivate students to want to look at the issues.

The teachers began to realize that collaboration was a necessary but not a sufficient condition to achieving the most desired educational outcomes for their students. In order for the projects to continue to move up the continuum toward enriched general education, new questions, new insights, and new collaboration must enter in. When teachers see

these opportunities for learning, their decisions about which materials to use and what concepts to teach become less difficult, less theoretical, less esoteric. Perhaps some lines from John Dewey (1916) make the point clearly:

> Both practically and philosophically, the key to the present educational situation lies in a gradual reconstruction of school materials and methods so as to utilize various forms of occupations typifying social callings, and to bring out their intellectual and moral content. This reconstruction must relegate purely literary methods, including textbooks, and dialectical methods to the position of necessary auxiliary tools in the intelligent development of consecutive and cumulative activities. (pp. 368-369)

The participants in this research seemed to realize by the project's end that collaboration was but the "thin edge of the wedge" which leads to higher purposes and richer processes in education—an uncommon education. The interventions provided insights which students and teachers are not currently able to get from their specialty areas. For example, ACME Crew was dealing with cheap imports which were causing a furniture business to fail. By involving social studies, they were able to bring in ideas of competition and free trade. In turn, without collaboration the social studies attention to these concepts may have been very theoretical. But, for the ACME Crew students, there were opportunities to talk about these concepts in real situations. Another example comes from the groundwater quality unit. Student-teacher discussion suggested that there was a real problem of contaminated discharge into the St. Croix River, a problem requiring political action which must be solved. So the challenge for the teachers was not, "How can I get the kids to understand the effects of chemicals on groundwater?" Rather, it required an education which may change what students do after they leave high school and act as voters and citizens. In *Democracy and Education* (1916), John Dewey expressed his thoughts about the vocational aspects of a general education which prepared students to be able citizens and workers:

> but an education which acknowledges the full intellectual and social meaning of a vocation would include instruction in the historic background of present conditions; training in science to give intelligence and initiative in dealing with material and agencies of production; and study of economics, civics, and politics, to bring the future worker into touch with the problems of the day and the various methods proposed for its improvement. Above all it would train power of readaptation to changing conditions so that future workers would not become blindly subject to a fate imposed upon them. (pp. 372-373)

Beyond Conventional Research Questions: An Interactive Analysis

In this section, we will move beyond the research questions identified in collaboration with teachers and administration at the project sites to share our reflections on happenings and events during the course of this project. In making this response, we came to define reflective thought much the way John Dewey defined it in *How We Think* (1910): "Active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it, and the further conclusions to which it tends constitutes reflective thought" (p. 6). In developing this section, we reflected on what it was that we were saying about collaborative practice; we wondered whether we had captured the context, understandings, and aims of our research partners; and we considered the usefulness of these insights to other researchers and school sites dealing with enriching both vocational education and general education.

This has not been an experimental study guided by a standard design, which is not to say that there was an absence of planning. As the reader has learned, time was allotted for briefing and discussion with the participating teachers and administrators on the rationale of the study and its chief objectives. Data collection schedules were prepared with care. When the time came for reporting on the study, we once again were led to think about the responsibilities of teachers, the interests of students, and aspirations of administrators. How did these concerns affect the project objectives, and what were the means that would prove most effective in the process of reaching these objectives? These questions led to reflection on a new format for future implementation of thoughts on the melding of vocational with academic education. A name was coined—interactive analysis—reflecting one quality of the analysis. And there was another—schooling as process. What went on at Humboldt High School and at New Richmond High School was alive, not dead; vital, not inert. Yet the model shown suggests an education that is static; one which can be cut up into bits and packaged in the cells of a chart. This is a misleading representation. The collaboration among teachers involved the active collegial relation of at least two teachers in every one of the projects. The students also did more than learn in a passive way. If it were possible, the model would capture the dynamic quality of this collaborative project. This will have to be imagined along with the most important qualities: interaction and interrelation.

In interactive analysis, one part or component is affected by another. For example, in the model shown in Table 6 there are columns labeled objectives, means, and outcomes. We believe that objectives should be intimately associated with the means for attaining those objectives. (It is important to have feasible objectives. Those which are not realistic only lead to frustration and disappointment.) In turn, objectives are or are not reached. That is an outcome. Still the interaction has not been adequately described. The outcomeshave a special relationship with the objectives. To appreciate the nature of that relationship, it is useful to recall the classic Greek understanding of the *telos*, an end but an end that has a special quality. Many definitions of telos cast it as a consummation, fulfillment, a state of completion, something achieved, an outcome, product, the goal in a race, or, as in Aristotle, the end or purpose of action. It is this Aristotelian meaning, one compatible with the purposive nature of thinking written of by John Dewey, that best expresses our intent. A *telic* definition of the term "objective" emphasizes that it acts as an *aim*. In short, an objective is purposive. The target as an *end* behaves as a magnet; it is a beckoning target. In saying that one aims at the target, what is meant is that one intends (purposive) to hit the target. The aim and the end interact; they are related. The desired outcome is hitting (reaching) the target. That achievement defines a successful act or action.

This interrelationship of aim and end leads to collaboration of teachers. Students are drawn into the collaboration. The school and classroom become arenas alive with the communication and cooperation that are integral parts of collaboration. But it is to the interaction of collaborating teachers that our attention has been most given. In this collaboration there is a process of interaction that makes unexpected and new insights almost inevitable. The result is "educational serendipity." We will find striking evidence of it in the collaboration of a home economics teacher with a teacher of general mathematics and general science. The same fortunate fallout will be evident when we write of the ACME project and ACME Crew. It will be manifest in the collaboration of a teacher of French and the teacher of automobile mechanics. The point is that there is a give and take in the interaction/communication of collaborating teachers. They strike sparks and find new ideas in each other's teaching. Were this the place to discuss the fields in which the various collaborating teachers are expert, it would have to be said that the group of teachers in the vocational areas and those in the academic see possibilities in the areas taught by their collaborators that are not evident to the specialists themselves. For example, a social studies teacher familiar with policy blending economic facts with political ones sees things

in the development of home economics that the home economist might overlook. The same can be true in almost every other instance of collaboration. Examples of this serendipity in collaboration are the chief point in *General Education: Vocational and Academic Collaboration* by Robert Beck.

An Example of Interaction

The home economics (foods) teacher and the general mathematics and science teacher collaborated on a project that lasted five days. As was true of other faculty collaboration in the school, the teachers worked together with the active support of their principal. The objective of the collaboration was to grasp the concept "percent of" and to practice the calculation of percentage. The approach used by the home economics/mathematics team was not the only one observed in this study. A grasp of "percentage of" was also a part of the objective in another mathematics/statistics class.

Our object in mentioning this fact is simply to say that collaboration allows for much more diversity of subject matter than following the topic in any textbook. A teacher of mathematics and statistics, in collaboration with a teacher of business management, challenged the students to calculate the percentage of students interested in outdoor sports, the percentage of the group who were female, and other characteristics of the student population being sampled. The query was embedded in discussion of how this data could be graphically presented, how bias might be minimized, and other points. The objective of the study was to learn something of the process of gathering and compiling data, interpreting survey results, and expressing the data in such graphical forms as the pie and bar graphs. Students in business management would "cost out" any recommendation revealed by this "percentage analysis." All of these in-school exercises were tied into planning and laying out an area to be used for "frisbee golf." Using a "frisbee accuracy range," students collected data from several trials (i.e., distances thrown, left/right handed, ages, grade levels). Data was entered into the spreadsheet, database, and graphic functions of the school's AppleWorks® program.

Although the exercise was very different from what was planned, there need not be a question about preference for one approach. One was not better, only different. As seems so often to be the case, when there is collaboration of two or more teachers in different areas, issues arise that were not planned. These are happy accidents; what was

Table 6

Interactive and Process Matrix
Integrating Vocational and Academic Specialties

Actors	Objectives	Means	Outcomes
	Purposes and aims	The act or process	Objectives reached: Assessment by achievement, performance tests, and other
Administrators	To increase collaboration, enhance the general satisfaction of students, and lessen academic failure, dropout, and negative types of behavior.	Advocating collaboration Providing resources. Providing time for collaborative planning. Rewarding collaboration (e.g., supplies, sabbatical, study leaves).	Different volume and mix of students and teachers in vocational and academic fields. Heightened staff morale. Lessened student dropout and destructive behavior. Increased degree of teacher and student communication, cooperation, and collaboration.
Teachers	To enrich the general education students. To enrich the general education teachers. To gain a deeper understanding of the possibilities of subject matter. To exercise the skills of communicating, cooperating, and collaborating.	Time for planning. Time for doing. The willingness to collaborate. Supplies and facilities (e.g., room, books).	Active student involvement and interest. New things learned by students. Student intention to continue in studies. Greater teacher/ student collegiality and teacher/teacher collegiality. Exercise in cooperation. Appreciation for academic collegiality as important for continuing professional/ general education.
Students	To increase sense of schooling.	A greater willingness and ability to cooperate. A willingness to work and attend classes. Increasing communication and cooperation with students who have different goals.	Observation of teacher/ teacher collaboration. Learned self-confidence. Continuation of studies or jobs. Greater teacher/student and student/student collegiality.
Consultants (Researchers)	To understand more fully the meaning of general education. To learn more about facilitating collaboration.	Observation and reflection of the efforts at cooperation, communication, and collaboration.	A fuller understanding of general education. Thoughts on future implementation.

earlier referred to as educational serendipity. In both of these instances, the mathematics/business education collaboration and the home economics/mathematics collaboration, social studies could have been a partner. This was true in almost every instance of collaboration observed in the two high schools. Other fields of study, both vocational and academic, could have found a niche in the collaborations, however, social studies was the outstanding example.

While the impact of the collaborations on general education merits noting, for the moment we will overlook general education and return to the class in which teachers of home economics and general mathematics/science collaborated in a class by calculating protein distribution. The challenge was twofold: (1) to calculate the percentage of the distribution of the world's food supply, the per capita income, and the continental area; and (2) to calculate the percentage of a given substance (e.g., the percentage of fat or water in cuts of beef, pork, and turkey) in order to determine the relevance of that information to consumer choice. Although the concept of interactive analysis had not been a part of preparing the units in which these teachers collaborated, there was a clear perception of objectives and means to be used in reaching the ends desired. For example, in one session the students were confronted with applying percentage to the distribution of the world's food supply (with the emphasis on protein distribution), income, and population. There were ninety-nine chairs in the room and students were clustered by continent. Without considering the manner of assignment, the class was immediately confronted with facts (data) of the "real world." Students sat with birth cohorts, each of the groups representing a continent from which the students or their families had come. The percentage calculations began with determining the percentage of the room's ninety-nine chairs which were occupied by one of the cohorts, each of which represented a continent. The remaining calculations included the percentage of the world's land occupied by each "continental cohort"; the percentage of the world's Gross National Product, expressed in U.S. dollars, possessed by the average citizen of each continent; and the percentage of the world's food supply available to that average citizen. Cookies were allotted to represent the average percentage of food available in each of continents. As shown in Table 7, visual aids were used to assist the expression of percentages

It was clear to the teachers that their collaboration easily could have been extended to include a teacher of social studies. Questions and issues of ethics—justice, fairness, and equity—were produced. Instructors in collegiate courses in ethics would have envied these

high school students. All of this is manifest when one glances at the "reflective questions" distributed to the class at the end of that first day. These contributions to the general education of the students were an example of the educational serendipity happened upon in this study.

Part of the class were students enrolled for credit in mathematics; the other students were enrolled in home economics. The combined group had seen the teacher of home economics just as involved in the computation of percentages as was the teacher of mathematics. In the sessions that followed, the images were reversed. The students saw the mathematics teacher cooking. Similar instances of role reversal can be a side effect of collaboration.

Allied with role-reversal, but far more important, is the student perception that vocational fields can be of real use in academic studies. For example, there were interventions that involved the graphic arts teacher in collaboration as a resource person for teachers of college preparatory English and geometry. (The importance of administrative support was also illustrated by this instance of a teacher acting as a resource person in a collaborative situation. The principal allowed the teacher of graphic arts to reassign students who had enrolled in his previously scheduled class, freeing him for these collaborations.) Groups of five or six students in academic subjects were helped to learn the potential of graphic arts for their subject matter: Students of English wrote business letters using a computer in the graphic arts laboratory, and geometry students produced designs in three dimensions and practiced computer aided drafting. Although this study has focused on possibilities for collaboration between vocational and academic fields, collaboration could be as productive if it took place *within* the vocational or academic domains. A teacher of home economics was also among those to whom the graphic arts teacher acted as a resource. In a clothing-related course, home economics students used silk screen techniques for the first time.

Exercising their students in the practical application of what they learn in mathematics and science was included in the instructor's objectives. To this end, a good deal of measurement had to be done in the class studying percentages. When the class moved to the home economics laboratory for processing food, the learning was a function of preparing food and charting information on percentages of water and fat. To determine the percentages the students had to become familiar with appropriate apparatus (e.g.,

Table 7

Learning Materials to Support Collaboration of Home Economics and General Mathematics-Science Teachers

Land and Dollar Distribution

	Population	Continent	Land Distribution	Total Dollars	Number of Cookies
1.					
2.					
3.					
4.					
5.					

Reflective Questions

1. What were your thoughts as you were assigned to your continent?
2. Did the land distribution seem fair? Why or why not?
3. How did you feel about the money distribution compared with the other continents?
4. What was your reaction to the food distribution?
5. What was the role of math of math principles in today's activities?
6. Do you have any additional comments, thoughts or reactions to today's class?

beakers, balance scales), the use of which was necessary to get the data that would be tabulated. In turn, the information on percentages of fat and water in the several cuts of meat was applied in discussions on comparative cost and nutritional value.

All the projects linked to this study were too short lived to permit adequate assessment. Both teachers and students were interviewed, and the responses do furnish a clue to the effectiveness of the collaborations. What may be most helpful to take from the teacher responses is the good feeling teachers had in working with their teammates. However, every teacher regretted that all too short a time was available for the collaborative planning. If collaboration is to succeed, it is obvious that collaborative planning time is an issue with the highest priority. Student reaction was positive on the whole, but it offers too limited a cue as to what the student perceived to be the net gain or loss to their general or future education or vocational plans.

Unlikely Collaboration

Percentages may be thought common ground for teachers of general mathematics/science and home economics (foods). If common ground were a limiting condition, collaboration would be severely restricted. But that is not the case. There seemed little to promise in the collaboration of a French teacher and an automobile mechanics teacher, but collaboration is profitable even when it involves an unlikely team. In the instance of the French automobile intervention, the objectives were clear—students were to learn a vocabulary that included the parts of an automobile. They were to learn what to check when doing routine maintenance of a car. The third objective, not directly related to automobiles, was to learn certain elements of French grammar.

The means to the end included a visit to the automobile laboratory which was a welcome diversion for the students of French. In the laboratory, vocabulary was reviewed, and the students learned a good deal about what is under the hood of a car, and what was involved in maintenance. French terms for the parts of a car were part of the work, but the maintenance and the scientific concepts involved were discussed in English. In other words there was no artificiality, no undue strain for the students because the collaboration involved a class in French.

Educational Serendipity

As was so often the case, the French class could have easily further enriched its potential for general education. When the automobile mechanics teacher discussed lubrication, the function of molecules in oil, it opened the way for an introduction of physical science. The subject of coolants, the role and action of the hydrometer, power steering and brake fluids, the phenomenon of freezing water, the car battery, and anti-pollution controls carried the discussion farther into physical science.

The same possibility for collaboration was demonstrated back in the classroom when the class read and talked about the European Community. A teacher of social science interested in matters connected with international trade and commerce could have joined with the teacher when the latter confronted the class with an excerpt from an article in the *Wall Street Journal*, "The EC and Japanese Cars" (1990):

> The French and Italians . . . want their auto industries protected against wholesale invasion by Japanese car makers. They, along with Britain, Spain and Portugal, currently limit the number of Japanese cars sold in their countries. During a negotiating session in Brussels earlier this year, French European Affairs Minister Edith Cresson declared that "the final aim" of the Japanese car makers is "to conquer market share and then kill" their European competitors.
>
> But the countries that don't restrict Japanese auto imports, including Belgium, Germany and the Netherlands, are loath to put EC-wide restrictions on them. They fear that limiting imports would also limit competition, leading to higher auto prices for EC customers. (p. A11)

A Most Unique Instance of Collaboration: The ACME Project

Though the ACME project has been mentioned, more should be said about the collaboration. In the project, teachers in social studies (with an emphasis on economics), wood technology, and family science collaborated in guiding an unusual project. As the wood technology teacher envisaged it, the project was to begin with an imaginary situation. A family-owned furniture manufacturing business was failing. Taking one of several roles—such as fabricating products to be marketed, devising marketing strategies, advertising and display—the students were to try to save the company. The students used strategic planning to focus their turnaround efforts, market research and planning to define new products, human resource support for personnel problems, and both teaming and assembly lines to produce a product. The three collaborating teachers acted the role of outside consultants paid to help the company. There were indifferent students and those

who felt the undertaking was foolish. They were "discharged" and would have spent their time in a study hall had not most asked to rejoin the project after the project showed itself to be popular and the object of a good deal of attention.

The three main categories of interactive analysis—objectives (aims); means; and outcomes, ends, or product—together with assessment, were especially well represented by ACME. The teacher, heading up the laboratory on wood technology, held to objectives that included having students involved with wood technology who ordinarily would enroll exclusively in academic subjects. He was pleased to have an opportunity to collaborate with other teachers in a project that asked students to become immersed in the actual manufacturing and marketing. He wanted students to experience the practical necessity of assessing the feasibility of plans for manufacturing and marketing, formulating a plan of work, and learning something about design, of both the product and its sale. Each of the collaborating teachers underscored that they aimed at or hoped for experiences of cooperation, with all that it entails for taking responsibility and persevering. Another of the teachers working on the ACME project set goals of learning to be responsible, cooperating to meet common objectives, and learning to understand more about oneself. The collaborating teachers felt that the students had learned the objectives set by the staff.

The means/skills that ACME called on were, at one and the same time, evident and subtle. When the decision was made, following market research, to produce and sell locker shelves, it was clear lumber would have to be acquired, advertising would have to be designed, and so on. It was much less obvious that willingness to cooperate, to discipline one's self in a joint undertaking, to be task-oriented, were all necessary. In the latter instance, the objectives of the teachers had become significant means/skills. That is, unless students learned to cooperate, learned to be responsible and reliable partners in the business, ACME would not succeed.

Among the means/skills to be highlighted was the organization of ACME. For example, it seemed well to divide the class into committees that functioned as teams. One team would survey consumer demand, "Would it sell?"; another team would attend to the assembly of the product; and a third team would be responsible for marketing. Similar groups of students were charged with looking after monies expended and collected. ACME replaced the imaginary "wood products business" which had failed. The students were determined to do what had to be done to insure that their "business" would prove

profitable. To that end the students, known as ACME Crew, selected leader/managers who saw to it that materials to be processed were selected with care and that adequate records were kept.

With the ACME project, the administration of the school went out of its way to cooperate with the students and teachers in securing the means needed to win the ends envisaged. It became clear that a statement of ends (aims, purposes and objectives) was not a challenge for the ACME Crew. The researchers turned their attention to outcome, to the assessment of the project in terms of what students got out of it.

In interviews with students it was evident that they had learned about the importance of being cooperative and responsible, but, at the same time, the students felt that they should have participated more fully in planning the project. Participating teachers felt that participation in the planning was the part of ACME that developed student enthusiasm rather quickly. A good deal of imaginative student participation became apparent. One teacher pushed this a bit further, "We don't know how to turn this thing off. Some of them [the students] want to continue this company all year." Again, "I saw lots of interest among the faculty . . . the mix of students has been real positive. Kids have bought in. We had some "unemployment" at the beginning, but we have none at this point. There is a lot of ownership." A more explicit comment by a teacher held that "the majority of students displayed enthusiasm and self direction for this project. A minority of students did not get much involved; they were considered unemployed or underemployed. Over the weeks more students did willingly participate in ways which made sense to them." Another teacher added a similar comment, "ACME marketing students are meeting after school. They are so enthused about this project that they are willing to "do school" even when they don't have to."

For their part, the students interviewed felt they had benefitted from seeing the need for cooperation and learning what it takes to really cooperate, to work with others on the solution of problems. The students could see that this would be useful in their work after graduation. Some of the ACME Crew saw the point of being able to work with others who seemed unattractive. As one student put it, "I had to work with this one guy who I just hated, but after we got on the same team I found that we could talk about the work." A teacher summed up the attention that had been given cooperation, "Cooperation was a high

priority—both for students and teachers. This should make cooperating on other projects a lot easier in the future, and it fits the school goals."

While reviewing the taped interviews with ACME Crew, one of the research teams passed along the following reflection:

> Students in the interviews were able to talk about the practical benefits they assumed would be transferable. It is difficult to project into the future for these young adults; they really know very little about adult life, and they had a limited vocabulary with which to talk about transfer. This is one area of education which has been neglected—knowledge of work and projecting one's own uniqueness into the future.

A significant point ended the comment:

> During observation it was clear to me that the students used a multitude of basic skills from other subjects and classes—math, surveying, measuring, communication, writing, speaking, design and display, marketing, [and] time management. If someone had pointed this out and then asked the students if they used the subjects they had studied, they most likely would have said, "Yes." Since these were not the stated objectives, students neglected to discuss these relationships and the practical benefits of their previous education.

Another Sense of "Practical Benefits"

Although most teachers and students consider practical benefits to be those things which are learned in school but are employed in one's post school career, another interpretation of practical benefits is the rewards for an enriched general education. This was very evident in the collaboration of biology and agriculture teachers, "Biotechnology Tissue Culture and Ground Water Quality." The project was identified as one joining biotechnology and sustainable agriculture. Four classes were exchanged in the course of a week. The agriculture teacher led tenth grade biology classes in a study (including field trips) of groundwater pollution and the attendant problems confronting those who live on and work the land, as well as, the urban population who depends on both the water as a resource and production of agriculture. It was plain that there were five objectives: to understand the health hazards of improperly treated water or sewage; to identify the basis processes used to treat water or sewage; to calculate the costs of treatment; to understand the laws which apply to the communities in which students live; and to heighten awareness of future plans for treatment of local water or sewage.

Focusing on St. Croix County's problems, the study touched on soil surveys, revealing the types of soil involved, and the phenomenon of leeching. Pollution of groundwater was illuminated by a demonstration managed by the University of Wisconsin-River Falls Soil Conservation Project along with a field trip to the Glen Hills watershed. The demonstration called the students' attention to the challenge facing citizens and to what citizens might do.

Plans were made to extend the project, allowing the entire student body to learn something of the same issues. Local conservationists and the nearby division of Monsanto Chemical were asked to join forces in the study. The teachers of biology and agriculture planned to enlist the cooperation of teachers in social studies, physics, chemistry, and others as yet unidentified. Assuming that a general education should make a difference in a student's level of concern for the environment and the student's political awareness, this demonstration would be of practical benefit.

Reaching Beyond the School

Not all of the projects were anchored in the classroom. In a school enrolling many young people whose parents or grandparents had come from other countries, a teacher seized on the opportunity of offering a two-week unit in family studies. Happily there were resource teachers who visited with the students on patterns of family life in Mexico, France, and Japan. While more than those three countries were represented in the immediate backgrounds of the students, it was apparent that the state and country had been nourished by more than one culture. The class compared and contrasted the types of family heritages which they had learned about and which they had incorporated in the family trees constructed for class presentation. The use of a local historical society, talks with grandparents, and other resources were noted. The effects of immigration and the preservation of cultural heritage (e.g., of a language) were also discussed. This added to the cosmopolitanism that the school held as an objective for general education.

In a counseling rather than a classroom setting, the goal was to assist teachers in the preparation of imaginative and creative students who can make use of academic experience in career choices. The challenge was to move this beyond rhetoric. The students were to see that talking in favor of creativity and imaginativeness were practical. To this end, leaders from business and labor were invited to meet with the students. These talks were

enriched and made more realistic by collaborating teachers working on a unit called career communication. Collaborating teachers noted the following areas were some of those identified with potential: time management; stress management in family and job; human relations or "getting along" in family and job; how to run a productive meeting; and how to use a telephone effectively. The assessment of these "outreach" projects was not undertaken in the short time available.

RECOMMENDATIONS

This section of the report describes the recommendations which are justified based on the findings and reflections on the purposes, activities, and outcomes of the study. Recommendations include attention to both further research and practice and to policy relating both to vocational and academic education.

Recommendations for Further Research

Rather than provide a typical list of further research that should be done based on the pilot study reported here, we have chosen to describe in detail two different but related studies that are considered to be of very high priority as follow-up work. The first study focuses on more field work to expand and refine the working knowledge on integration and innovation in vocational and academic education. Research along this track might interest those individuals who wish to improve the current situation in secondary schools. The emphasis is on improvement and refinement. It suggests an evolutionary, inventive, cooperative process.

The second study takes a different direction in developing new goals and structures for schools to facilitate integration and innovation. This line of research may be of interest to individuals who believe that the existing structure of a contemporary comprehensive high school presents too many barriers to allow for significant development of vocational education and enriched general education for all students. There was considerable evidence in our findings that major structural barriers exist in schools to hamper the curricular integration and innovations we had in mind. The second proposed follow-up study

emphasizes restructuring and new designs for the comprehensive high school. It suggests a more revolutionary, inventive, collaborative process.

Study 1: Portfolio of Models of Integration and Innovation in Academic and Vocational Education

The purpose of this project would be to develop a portfolio of models or prototypes of integration and innovation in vocational and academic education. The project would be a direct response to the needs expressed by top school and government executives as well as practicing teachers and administrators for information of this type. They want to see and review descriptions of actual models or prototypes of integration and innovation. This project would expand on the work described in this report. Models of integrated and innovative vocational and academic education would be developed through a combined strategy of selection and development. At each model site, qualitative and quantitative data would be used to examine the curricular development and implementation process. Sites with high potential for or already on-going integration and innovation work would be given priority in selection. Staff training would be used to stimulate and facilitate integrative and innovative work. Evaluation procedures would be used to monitor the integration and innovation process and impact on students.

It is recommended that scanning for potential sites of integrating and innovative projects be conducted in a reasonable travel radius of the project director's location, depending on availability of funds. Ten sites might be selected in year one with continued follow-up during the second year. Sites would be selected to represent a diversity of people, geographic locations, and school organizations integrating possibilities, strategies, and levels of maturity in integration and innovation. Ideally, each site would involve a minimum team composition of administrator, counselor, three vocational teachers, and three academic teachers.

Project team training would be intensive as regards the existing knowledge of integration and innovation. Consultants with expertise in cognitive psychology, changing nature of work, and curricular areas in vocational and academic education should be involved. Teams would be expected to develop, implement, and evaluate curricular integration and innovative interventions.

Case studies of each site would constitute a portfolio of models for integration and innovation. A synthesis across cases would draw implications for policies and further research regarding curriculum development and implementation strategies to support integration and innovation in vocational and academic education.

Five different types of products are envisioned from the project:

1. A portfolio of models or prototypes of integration and innovation. These models would serve as concrete examples of integration and innovation as developed in the context of specific situations.

2. An edited diary (journal) of those doing integrating and innovative work. This diary would provide insights into the realities of the work of integrating and innovation in vocational and academic education—both barriers and facilitators and ways of dealing with them.

3. A resource group for networking on integration and innovation. This group would be similar to the Writing Project now developing in various sites across the country.

4. Position papers and action research studies on integrating and innovation issues developed by collaborative teams. Project staff, in cooperation with participants, would select issues for more in depth analysis and discussion.

5. A project report summarizing overall findings.

Study 2: New Designs for the Comprehensive High School

The evidence presented in this report suggests that many barriers to implementing the collaborative interventions existed in both of the comprehensive high schools. In order to increase and enhance the opportunity for an uncommon education for all students, a restructuring or redesigning of the comprehensive high school should be pursued. The approach taken by this research would be to begin to synthesize what is known from NCRVE work, restructuring projects around the country and experiences in other countries. The synthesis would be presented in the format of new designs for the comprehensive high school, particularly for urban areas. Focus on new designs for the whole school would force the synthesis of findings and recommendations from projects that have been aimed at separate components or strategies for improvement. The new

designs would provide a vision to guide long-range planning and policy so that the separate elements can come together, and advantages can be taken of opportunities to put whole new designs into place. By developing new designs in sufficient detail to include desired learner outcomes, learning processes, organization, staffing, and partnerships, the designs can be present in ways that realistically inform decision making in the context of benefits, needed changes, and costs.

Developing the new designs in close collaboration with imaginative, practicing hers, administrators, and other support staff, state education agency personnel, teacher educators, policy makers, and community representatives would help insure that the prototypes are strategic in view of the problem and yet workable in practice. Without collaboration of this kind in the design process, there is substantial risk of mere wishful thinking and idealistic rhetoric.

Overall, the purpose of this research would be to develop new designs for the comprehensive high school, drawing on the knowledge and process described above, which should enrich the general or common education of all students. This enriched general education would include better alignment of vocational and academic education and specifically address the problems noted earlier to redesign the comprehensive high school. The idea would be to provide preferred arrangements or blue prints for high schools with an eye to the future needs for work and family life skills.

The method used in this project would heavily involve group process to move the design through a series of phases. The phases should include the following:

- Phase 1: Reviewing and finalizing project plan of operation
- Phase 2: Describing desired learner outcomes for high school
- Phase 3: Describing desired learning process (curriculum, instruction, assessment)
- Phase 4: Describing desired organization and partnerships
- Phase 5: Describing desired staffing and professional training
- Phase 6: Describing desired facilities, equipment, and supplies
- Phase 7: Describing cost of new designs
- Phase 8: Developing strategy to announce new designs

Phases 1-3 could occur during year one, with phases 4-8 the focus during year two. However, the design elements of each phase would be interactive, so there would be implications and work on all phases during each year. Phase 1 would be used to fine tune the design of this project with wider inputs and intensive discussions as a way to best insure its success.

Focus groups would be employed to raise and clarify issues and potential solutions during each phase. A Design Group would be used to guide the project to consensus on issue resolution at each phase. Both the focus groups and the Design Group would draw from the stakeholders noted in the above section on scope and purpose. Group work would be preceded and followed by extensive staff work to insure that the most relevant findings of research and practice were brought to bear during group processes.

Other Ideas for Further Research

Many other further studies could logically emanate from the work reported here. For example, the following questions merit careful examination:

1. Is the collaboration of teachers in vocational fields with teachers of academic subjects more likely to be successful with students who have been thought of as college bound—those students who are comfortable with abstractions and/or generalizations—than other groupings of students?

2. If collaboration can be successful with students grouped by various characteristics, would it be helpful to alter the aim and content of the collaboration in view of the characteristics of students in a particular class?

3. Assuming that not all vocational students are likely to be equally successful in vocational studies, which types of students are most likely to benefit from collaborative teaching? In null form, one would hypothesize that the students in vocational education who are most likely to succeed in collaborative teaching are unlike their counterparts enrolled in an academic curriculum.

4. What are the common problems making up the problem areas in the proposed framework for the subject matter of vocational education? Do they vary by age, sex, cultural background, geographic location? What criteria should be used to

select problems to be emphasized in vocational education? In secondary versus postsecondary programs?

Recommendations for Practice and Policy

The following suggestions exemplify some of the implications for action that are thought to flow from the experiences of this project. We invite the reader to draw further implications from personal understanding and interpretation of this study.

1. In order to get the most out of collaboration between vocational and academic teachers, be modest in your beginnings, and increase the complexity of the project in a stepwise way. Start with two, possibly three, teachers. As you talk about possibilities of collaboration among the subject matter in your courses, be mindful when and where teachers of other subject matter areas might be involved. Add each new voice to the project as it is needed.

2. What are the signs that it is time to add another teacher to a collaboration? Watch for two signs. The first sign is a secure feeling by teachers that they will be able to move ahead with success. The second sign is questions which arise out of the problem of study which would benefit from the knowledge of one or more additional vocational and/or academic subjects. For a more complete description of how problems of vocational life "back into" academic areas, read Copa and Tebbenhoff (1990).

3. Allow for educational serendipity in planning and practice. The results of collaborative intervention will only be obvious after the fact. In the words of Harry Silberman, "You can't have a purpose which you have not yet experienced" (Copa et al., 1985, p. 9-1). The more teachers and students learn about their fields of interest, the more they can learn. One teacher has seen one part of the picture; the other has seen a different part. As they talk about their own reality, it causes a spark—educational serendipity—the blinders are removed, the margins pushed aside. The point is not to say, "There, now I've got it right"; rather, the point of collaborative intervention is to say, "Next time we try this I think we will . . . ." Continued questioning and curiosity are means to an end and an end in themselves.

4. Working together as academic and vocational teachers does not mean "turning your back on" or ignoring specific skills, be they vocational or academic. The uncommon education described in this report is not a zero-sum game. Rather, teachers and students, by working together, gained in general education, and the interaction helped to sort out what was important in the curriculum.

5. Become aware of and try to understand the framework for the proposed subject matter of vocational education and the role of collaboration as a way to enter the conversation about these matters, develop your own perspectives, and shape further directions. One approach would be to attend workshops devoted to these and related issues sponsored by the NCRVE or other agencies. State and national education agencies and organizations should take initiative to provide workshops of this kind for vocational and academic teachers, counselors, and administrators.

6. The NCRVE should help identify and find publishing outlets in subject matter journals (in both vocational and academic fields) for articles briefly describing the teaching of problem areas in the proposed subject matter of vocational education and/or involving collaboration of teachers in vocational and academic subjects. The NCRVE should also actively disseminate information on collaboration and innovation in subject matter to those teaching collegiate courses in curriculum and instruction.

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APPENDIX 1

Agenda for Training Sessions

SUBJECT MATTER OF VOCATIONAL EDUCATION PROJECT
FOR THE
NATIONAL CENTER FOR RESEARCH IN VOCATIONAL EDUCATION
UNIVERSITY OF MINNESOTA

PILOT SITE
SUMMER INTENSIVE TRAINING
JUNE 25 AND 26, 1990

AGENDA

Day 1

Location:	University of Minnesota, St Paul Campus Department of Vocational and Technical Education 1954 Buford Avenue
8:15 AM	Coffee and informal welcome
8:30 AM	Introductions and overview
8:45 AM	Case Study: "What if Polly Williams Lived Here?" In small groups, participants will use a case study to get better acquainted, build awareness of common mission, share information about subject area being taught, and identify the central issues for the project.
10:00 AM	Break
10:15 AM	Case study continued
11:30 AM	Lunch
12:15 PM	Information and expectations: In the afternoon session, George Copa and Bob Beck will share information about this National Center for Research in Vocational Education (NCRVE) project. Specifically they will share their thinking about (1) The Subject Matter for Vocational Education, (2) General Education: Vocational and Academic Collaboration, and (3) working across curricular areas: What do we already know?

2:45 PM Summary of the day

3:00 PM Adjournment

Day 2

Location: Humboldt High School
30 E. Baker Street
St. Paul
Meet at Main Office

8:15 AM Coffee and overview of the day

8:30 AM Research plan:

Participants will prepare to collaborate in reaching project goals. Specifically we will address (1) framing the research question, (2) developing the plan of study, and (3) answering the research question.

10:15 AM Break

10:30 AM Generate potential ideas for interventions

11:30 AM Lunch

12:15 PM Developing tentative Plan of Work:

Participants will work together to develop tentative plans for two weeks of teaching in the context of the project goals. These plans will include purpose, questions to be answered, identification of sources of information, and next steps. Each participant will have the opportunity to present ideas to the group.

2:30 PM Identify next steps for this group

Set date for two to three hour follow-up meeting in late August or early September. Bring your calendars.

3:00 PM Adjournment

APPENDIX 2

Case Study Used to Support Training

CASE STUDY

"What if Polly Williams Lived Here?"

Participant Introduction

You are a teacher for Independent School District #000. This year you taught _____ _____. With _____ years of experience here and in other districts, you have also taught courses in _____ _____. You are licensed by the state to teach _____ _____.

With all of your knowledge and experience you can honestly say that your favorite teaching assignment is _____ _____. If given the chance you would also love to develop and teach a course (or unit) called _____ _____ which would appeal to _____.

Before you made a commitment to public school teaching you worked at other jobs. Starting with volunteer work and part time jobs when you were _____ years old, you _____ _____ _____ _____.

Furthermore, having grown up in _____ _____ you seem to know a lot about the _____ industry. As a hobby you still find time to _____ _____.

What if Polly Williams Lived Here?

Today: Market Information

You are looking forward to working at The Secondary School for the foreseeable future. It is an established school of 1200 students who live within a ten mile radius of the building. The next nearest public school is fifteen miles away. To date public school choice hasn't really affected your life. The nearest schools are both private. They are New Paul Academy and St. Richmond Catholic School. Both schools offer education for grades K-8. Tuition bills start at $3000 yearly.

New Paul Academy is located in the middle of a large residential area of moderately priced homes. Some low-income housing is within walking distance of the school. This school began ten years ago as a K-4 Montessori type school. Four years later it added grades 5-8 because the parents were reluctant to transfer students into the "big" public school for fifth grade. You heard that parents were worried that no one would get to know their son or daughter. In March of this year the local paper ran a story about New Paul Academy. Because of the voucher plan, its board is planning on adding a 9-12 program if there is enough student interest.

Late April, 1991

On a warm Saturday afternoon in late April, you chatted with Carolyn Nice, your next door neighbor. She told you that she was thinking seriously of enrolling her ninth grade son Jason at New Paul Academy next year. Carolyn said that they'd thought about this before but with two other children and the uncertainly of her job at Indianhead Peripherals, the $3000 yearly tuition was out of the question. Now with $2500 from the voucher plan they were more seriously considering the private school.

Jason's older sister Tami works twelve hours a week ($4.00 per hour) as a cashier at the discount store. Tami is like most of her classmates. Almost three-fourths of next year's senior class will hold down part time jobs. Of those working, fifteen percent are supervised by a work experience or coop teacher. She spends her free time with Steve. After graduation, Tami plans to go on to school if she can get a scholarship, but she knows that she must keep her job too. Her boyfriend graduated last year and works full time at Indianhead Peripherals in the shipping department.

June 1, 1991: Invitation to a Student Focus Group

When you received the hand written invitation from this years' graduating class, you decided to go. The invitation said that members of the class of 1991 would be discussing their high school education. This was the first time since you have worked for ISD #000 that anything like this had occurred. The meeting was organized by Ed Anderson, a popular science teacher, and Mrs. Susan Chang, parent of a graduating student and a former school board member.

June 6, 1991: The Focus Group

The meeting was today, Tuesday of graduation week. There you sat, listening to fifty members of the graduating class telling you (and twenty-five other educators) about their hopes for the future and their suggestions for improvement at their school—your school. You made some notes.

Thinking about their comments made you think of Polly Williams. It was just this time last year that you first heard of Mrs. Williams. Until that day she and the cause she represented—an experimental voucher plan for Milwaukee Public School children—were a part of someone else's world. When you got home, you pulled out the editorial you clipped from the *Wall Street Journal* ("Teachers vs kids," 1990). It read in part,

> The Wisconsin voucher plan is the brainchild of State Rep. Polly Williams from inner-city Milwaukee. She raised four children as a single parent on welfare before finally graduating from college. Elected as a Democrat and twice the chair of Jesse Jackson's campaign in Wisconsin, she has nonetheless become convinced that government programs prevent her constituents from exercising real power and choice in their lives. Nowhere is this paternalism more evident than in the public-school monopoly.
>
> Convinced that the rigid bureaucracy of Milwaukee's public schools would never reform itself without outside competition, Mrs. Williams pushed through a bill that will allow 1,000 low-income Milwaukee students to attend private, nonsectarian schools. For every child using that option, the state will pay up to $2,500 in tuition and subtract the money from the state's support of Milwaukee public schools.
>
> Mrs. Williams says her plan is not designed to undermine public education, but to force it to improve. She says the notion that sending minority children to private schools will promote segregation and elitism is nonsense. Many Milwaukee private schools are multicultural or Montessori institutions with tuitions that are discounted to accommodate lower-income families. In both Milwaukee and nationwide, minorities make up 13% of those attending private schools.

You left the student meeting deep in thought, convinced that the students' wants, needs, and suggestions were important. If students and parents could pick a school, then you were going to be a teacher of choice, in a school of choice. But you couldn't do it all by yourself. You called three of your colleagues who also were at the student meeting and asked them to meet you at the Lock and Key coffee shop at 7:30 a.m. Saturday morning.

Saturday Morning: Lock and Key Coffee Shop

Over the bacon and egg breakfast special and coffee, you discussed the school year. The year end was unusual; all of you noticed an air of unfinished business on the last days when school grades and paperwork were completed. Teachers were wondering about enrollment in their ninth grade classes next fall.

With your coffee cups refilled, you also compared notes from the student focus group. The four of you heard students saying that:

- The future is scary and unknown. We need to have visions of what might be possible for us to be and to do.
- We want to feel that what we study and learn in school has meaning and relevance for other parts of our lives, both during school and after we leave school.
- We want to be able to "try things out" and even fail without danger of becoming failures ourselves. We need the kind of feedback on our efforts that helps us grow and learn.
- We want to have contact with adults who offer relationships built upon mutual caring and respect, and who make us feel competent and capable.
- We need to be able to talk about important life experiences in safe and caring settings.
- We want to have options in the ways we learn and meet our special needs. Equally important, however, we often need support and assistance in working into the unfamiliar settings in which these options are often found.

- We need help in developing effective ways to consider the many choices open to us and to make wise decisions about what to do.

- We need to learn some specific skills that allow us to do something or we need to learn some things especially well that other people value. (Minnesota Department of Education, 1988)

Then the discussion turned to the voucher plan and New Paul Academy's plan to add grades 9-12. All of you agreed that $2500 per student is money that you'd like to capture and retain at your school. And you are determined to offer the best possible courses in order to capture it. In fact all of you had units "on the drawing board" just waiting to be taught if only you had a little time, money, and a "green light" to go ahead.

School regulations always seem to be in the way, but the new climate of competition helped the four of you decide that waiver requests will probably not be necessary. After all, just in the small Lock and Key group, you have experience and teaching licenses to prepare and teach high interest and rigorous classes. Besides, even if you needed new information, all of you knew how to ask the right questions to find it.

Your Decision: Start with Ninth Grade

As a group you decide to prepare responses to the graduates' concerns. This would be in the form of new units of instruction. Ninth grade enrollment is the big question so you have a starting place. You'll talk to the principal this week. Once your plans were mapped out, each of you will actively inform parents and students about your new ideas.

The Following Week: The Green Light

Within the week the pieces started falling into place. The principal welcomed your initiative. Through a lead from another teacher you found $5000 in research money from the University. Your outline began to take shape. It looked something like this . . . .

Teachers vs. Kids

The time has come to ask just whose side the teachers' unions, school bureaucrats and some civil-rights groups are on: their own or the kids who endure the dismal state of education in so many parts of this country? In Wisconsin, the answer is becoming very clear.

There, officials of the state's largest teacher union and officials of the NAACP are suing to have the nation's first experiment in school vouchers for low-income children declared unconstitutional. If they win, the losers will be hundreds of inner-city children who expect to attend a school of their own choosing in September.

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Polly Williams

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The groups suing to block the Williams plan say the transfer of money from public to private schools is unconstitutional, though by that reasoning a city couldn't contract out garbage collection to a private firm. The real objection to vouchers is the fear that they will work and thereby expose the loss of faith in the public-schools system.

Milwaukee Alderman Larraine McNamara-McGraw says the public-school system is "not a perfect structure, but it's the only one that pretends to educate all the children." Mrs. Williams says that "pretends" is precisely the right word. "If you keep giving money to the same doctor and the patient stays sick, you've got the right to get a second opinion," she told us.

State School Superintendent Herbert Grover has practically begged teachers' unions to challenge the plan in court. He calls vouchers "ludicrous," and hopes the suit results in an injunction that would keep him from implementing the program this fall. (The NAACP in Wisconsin hasn't yet clarified its rationale for opposing the program.) Meanwhile, he is forcing schools that want to accept students with vouchers to comply with a blizzard of rules by June 15.

Mrs. Williams expects what she calls "the poverty industry" to throw up more roadblocks. "We have to be saved from our saviors," she says. "Our liberal friends have built their whole lives around taking care of us and they still want to feed us with Pablum. At some point, we want real food. We want to make our own decisions whether our liberal friends like it or not."

This kind of talk is winning Polly Williams converts on both the left and right. Elaine Ciulla Kamarck, a senior fellow at the Progressive Policy Institute, says Mrs. Williams is challenging "an entrenched establishment whose livelihood depends on continuing certain programs regardless of their effectiveness." In Detroit, City Councilman Keith Butler is supporting a slate of pro-voucher candidates in this year's school board elections. In Ohio and Kentucky, black GOP congressional candidates Ken Blackwell and Al Brown are being urged to make vouchers a cornerstone of their campaigns.

As Brookings Institution scholar John Chubb points out in a nearby article, public education in America resembles socialist central planning. Like socialism, it cannot be fixed with half-measures or more spending. The system must be freed up and competition encouraged.

That is why the education establishment is trying to drive out Polly Williams's voucher plan with lawyers and strangling rules. Mrs. Williams's position is that this reactionary crowd doesn't have to choose between its own interests and those of the students: "If you all are worried about your jobs, try doing them better."

THE WALL STREET JOURNAL WEDNESDAY, JUNE 6, 1990

A Blueprint for Public Education

By JOHN E. CHUBB

The past decade has been the most ambitious period of school reform in the nation's history. But evidence of school improvement—e.g., in test scores and dropout rates—is almost impossible to find.

How can government work so hard to solve a problem yet make so little progress? The conclusion Stanford Prof. Terry Moe and I reached—after analyzing more than 20,000 students, teachers and principals in a nationwide sample of 500 schools—is that government has not solved the education problem, because government is the problem.

The public education system functions naturally and routinely, despite everyone's best intentions, to burden schools with excessive bureaucracy, to discourage effective school organization, and to stifle student achievement. Efforts to improve schools are therefore doomed unless they eliminate or sharply curtail the influence of the institutions that cause the schools' problems in the first place.

We consequently propose a new system of public education that will not be governed directly by politics but will be controlled indirectly through markets—through school competition and parental choice. Markets, we found, discourage excessive bureaucracy and promote more effective schools. Because states have primary responsibility for public education, the best way to establish a "choice" system is for states to withdraw authority from existing institutions and vest it directly in the schools, parents and students—as follows:

The Supply of Schools

The state will be responsible for setting criteria that define what constitutes a "public school" under the new system. These criteria should be minimal, roughly corresponding to the criteria many states now use in accrediting private schools—graduation requirements, health and safety requirements, and teacher certification requirements. Any group or organization that meets these minimal criteria must then be chartered as a public school and granted the right to accept students and receive public money. Existing private and parochial schools (as long as their religious functions are kept separate) will be eligible, and their participation should be encouraged, because they constitute a ready supply of often-effective schools.

School districts can continue running their present schools, but they will have no authority over any of the others that may be chartered by the state.

Funding

The state will set up a Choice Office in each district, which, among other things, will maintain a record of all school-age children and the level of funding—the "scholarship" amounts—associated with each child. This office will directly compensate schools based on the specific children they enroll. Public money will flow from funding sources to the Choice Office and then to schools.

The state must pay to support its own Choice Office in each district. Districts may retain as much of their current governing apparatus as they wish, but they have to pay for it out of the scholarship revenue of those children who choose to attend district-run schools.

As it does now, the state will have the right to specify how much, or by what formula, each district must contribute for each child. Our preference is for an equalization approach that requires wealthier districts to contribute more per child than poor districts do and that guarantees an adequate financial foundation to students in all districts.

Scholarships will also take into account special educational needs—arising from economic deprivation, physical handicaps, and other disadvantages—that can be met effectively only through costly specialized programs. State and federal programs already appropriate public money to address these problems. These funds should take the form of add-ons to student scholarships. At-risk students would then receive bigger scholarships than the others, making them attractive clients to all schools—and stimulating the emergence of new specialty schools.

Efforts to improve schools are doomed unless they eliminate or sharply curtail the influence of the institutions that cause the schools' problems in the first place.

Choice Among Schools

Each student will be free to attend any public school in the state, with the scholarship—consisting of federal, state and local contributions—flowing to the school of choice. Most students will probably choose schools close to home, but districts will have no claim on their own residents. To the extent that tax revenues allow, every effort will be made to provide transportation for those who need it, especially the poor and those in rural areas.

To assist parents and students in choosing among schools, the state will provide a Parent Information Center within each local Choice Office. This center will collect comprehensive information on each school in the district, and distribute and collect applications. Its liaisons will meet with parents to help them judge which schools best meet their children's needs.

Schools will make their own admissions decisions, subject only to nondiscrimination requirements. This step is absolutely crucial. Schools must be able to define their own missions and build their own programs, and they cannot do that if their students are thrust on them by outsiders. They must be free to admit as many or as few students as they want, based on whatever criteria they think relevant.

Schools will set their own "tuitions." They may choose to do so explicitly, say, by publicly announcing the minimum scholarship they are willing to accept. They may also do it implicitly by allowing anyone to apply for admission and simply making selections, knowing in advance what each applicant's scholarship amount is. In either case, schools are free to admit students with different-sized scholarships and to keep the entire scholarship that accompanies each student they admit. That gives schools incentives to attract students with special needs, since these children have the largest scholarships.

While it is important to give parents and students as much flexibility as possible, we think it unwise to let them supplement their scholarships with personal funds. Such add-ons threaten to produce too many inequalities within the system, and many citizens would regard them as unfair.

The application process must guarantee each student a school, as well as a fair shot at getting into the school he most wants. We suggest the following. The Parent Information Center will be responsible for seeing that applications are submitted by a given date. Schools will then be required to make their admissions decisions within a set time, and students who are accepted into more than one school will be required to select one. Students who are not accepted anywhere, as well as schools that have yet to attract enough students, will participate in a second round of applications, after which unaccepted students (there should be few) will be assigned to schools by the Choice Office.

Governance and Organization

The state must grant each school sole authority to set its own governing structure. A school may be run entirely by teachers or even a union; may vest all power in a principal; may be built around a committee that guarantees representation to the principal, teachers, parents, students and community members. Or it may do something completely different.

The state will also do nothing to tell the schools how they must be internally organized. It will not set requirements for career ladders, advisory committees, textbook selection, in-service training, preparation time, homework, or anything else.

Statewide tenure laws will be eliminated, allowing each school to decide for itself whether to adopt a tenure policy and what the specifics will be. This change is essential if schools are to have the flexibility to build well-functioning teams of professionals. Some schools may rely solely on pay and working conditions to attract teachers, while others may offer tenure as a means of compensating and retaining their best teachers.

Teachers will continue to have a right to join unions and engage in collective bargaining, but the bargaining unit will be the individual school or, as in the case of the district government, the organization that runs the school.

The state will continue to certify teachers, but requirements will be minimal. Individuals should be certified to teach if they have a bachelor's degree and if their personal history reveals no obvious problems. Whether they are good teachers will be determined in practice, as schools decide whom to hire, observe their own teachers in action, and make decisions about merit, promotion and dismissal.

The state will hold the schools accountable for meeting the criteria set out in their charters, for adhering to nondiscrimination laws, and for making available to the public, through the Parent Information Center, information on their mission, their staff and course offerings, standardized test scores (which we would make optional), parent and student satisfaction, and anything else that would promote informed educational choice.

The state will not hold the schools accountable for student achievement or other dimensions that call for assessments of the quality of school performance. When it comes to performance, schools will be held accountable from below, by parents and students who directly experience their services and are free to choose.

Choice as a Public System

These changes have nothing to do with "privatizing" the nation's schools. The choice system we outline would be a truly public system—and a democratic one.

Nothing in the concept of democracy requires that schools be subject to direct control by school boards, superintendents, central offices, departments of education, and other arms of government. Nor does anything in the concept of public education require that schools be governed in this way. There are many paths to democracy and public education. The path America has long been treading is exacting a heavy price—one the nation and its children can ill afford to bear, and need not.

Mr. Chubb, a Brookings Institution fellow, is co-author with Terry M. Moe of "Politics, Markets, and America's Schools" (Brookings, $10.95). A related editorial appears today.

Role Play: Your Proposal

In your small group, role play one of the following situations:

1. Two or more teachers make and keep an appointment with the school principal to present their proposals for new ninth grade units of instruction or courses.

   or

2. You invite Carolyn Nice and her son and daughters over for a glass of iced tea and a conversation about the new ninth grade proposals.

As you prepare this role play, here are a few questions to keep in mind:

1. In an environment of choice, what do you need to pay attention to?

2. What are you teaching now that is really appealing to parents and students?

3. If you propose a new unit, how will this be different than #2 above?

4. What is the relationship of what you've proposed to student needs?

5. State at least three ways your proposal could appeal to student needs.

6. How (why?) would you work across the curriculum?

7. How would you evaluate if this work is successful?

APPENDIX 3

Materials to Support Project Planning

Adapted from Kemmis, S., & McTaggart, R. (1982). *The action research planner.* Waurn Ponds, Victoria: Deakin University Press.

Name _____

Potential Ideas for Action

What are some general ideas for how you might improve one of your courses in the context of this project? Ideas might come from promising new ideas or current practices that are falling short of your expectations.

Center your attention on what is happening in your courses now and the purposes of this project. Try to think about the following questions:

- What is happening in my courses now?
- What are the purposes of this project?
- What could I change in my courses that would be an improvement in view of this project?
- What can I do about making these changes?

General ways to start thinking about improvements might be to complete the following sentences:

- I would like to improve the . . .
- Some students are unhappy about . . .
- I am perplexed by . . .
- . . . is a source of irritation.
- . . . is an idea I would like to try.
- How can the experience of . . . be applied in my courses?
- Just what do I do with respect to . . . ?

Try to approach your general ideas by considering what is presently happening in your courses and issues you are facing in teaching the courses. Now, in the context of the purposes of this project, what idea could you try out to improve the situation?

Write down four or five ideas which could be explored and tried out in your situation. Try to relate the idea, present practice, and the action which would lead to improvement. Write about thirty words for each idea.

Name _____

Criteria for Use in Selecting Among Potential Ideas for Action

You are now faced with selecting one of your ideas for action as a part of this project. In selecting the idea for action, you might consider the following questions:

- How important to you is the issue addressed by the idea?
- How important is it to your students?
- How well does the idea address the purposes of this project?
- What opportunities do you have for exploring the idea?
- Who might be interested in helping you put this idea into action?
- What constraints, political and practical, might you have with the idea in your situation?
- Is putting the idea into action manageable for you?

Try to settle on an idea you can do something about.

Name _____

General Plan of Work

Your next task is to develop a general plan of work for the idea you will be putting into action as a part of this project. We will try to approach the development of your plan in a series of steps.

I. General Idea

Describe the general idea you have selected to put into action. Give some information about the idea and its relationship to your present practice and the purposes of this project. Describe in about thirty words or so.

II. Context for Action

Describe the social and political context in which you will be putting your idea into action. In describing the context, attend to questions such as:

- What is happening already? Why?
- What are the opportunities and possibilities to try out my new idea?
- What are the constraints on content, instructional process, resources, my expertise?
- Who will be affected?
- Who needs to be involved? Informed?
- What information gaps do I have? How can I get the information?

III. Plan of Action

Describe as completely as possible at this time exactly what you have in mind to put your idea into action. Address each of the following questions.

Collaborator comments

A. *Exactly what are you going to change in your present practice?* Give a clear idea of what you are going to try to do.

B. *Why are you going to take this action?* Describe how the action will improve your practice and situation and how it will address the purposes of the project. Why should the action work?

Collaborator comments

C. *What are the intended effects of the action?* What do you anticipate will be the effect of this action on students? Others?

D. *Who needs to be involved in taking this action?* List them and what they have to agree to do.

Collaborator comments

E. *Who are the people who are affected by this action?* Describe how other staff, students, parents, and other community members might be affected by your action. Will you need permission from anyone?

F. *What resources will be required to take this action?* Describe the materials, equipment, space, or other things needed for your action to take place.

Collaborator comments

G. *What are the likely constraints and problems you will encounter in taking your action*? Describe possible constraints and problems and how you can deal with them.

H. *What confidentiality will it be important to keep?* Describe how confidentiality will be maintained in gathering information to assess the effects of your action.

Collaborator comments

I. *How can your actions be monitored to describe their effects and answer research questions*? Describe how evidence can be provided to answer the following general questions. Be sure you list both the **source** (i.e., students, yourself, colleagues, parents) and the **method** (i.e., observation, diary, questionnaires, photos, interviews). (1) What action was really taken? (2) What were the intended and unintended effects? (3) How has the context surrounding your action changed?

J. *What time table will be followed in taking action*? Describe your time schedule of key events that will make up your action plan. Be as specific as possible as to month, week, and time of day.

APPENDIX 4

Overall Research Questions and Data Collection Strategy

Appendix IV

(Draft 8/15/90)
(Revised 8/21/90)
(Revised 9/17/90)

Overall Research Questions

(Humboldt and New Richmond High Schools)

RESEARCH QUESTION	WHAT DATA IS NEEDED	FROM WHOM	WHEN	HOW COLLECTED	COMMENTS
1. What were the effects on students?					
1.1. Did students learn objectives of units of instruction?	Objectives of unit Performance on objectives	Teachers Teachers/students	Before After	Teachers judgment Teachers judgment	Any special effects?
1.2. What things did students learn (process and/or subject matter) because of project? (i.e., relationship among courses, new learning activities, better understanding of content through application)	Description of what learned	Student Teacher Researcher	After (During) During	Questionnaire Small group interviews Observation in class Journal	
1.3. Did attitude toward learning change? (i.e., more motivated, more involved, more positive, "buy into", value other students as teachers)	Description of attitude	Students	Before/After	Questionnaire	How to get before measures? What dimension of to ask about?
1.4. Did the students see collaboration among teachers? What were effects on students?	Did you see? What impressions?	Students	After	Questionnaire	
1.5. Did students find some practical benefit to unit of instruction? (i.e., in work or family life, other)	About practical benefits	Student Teacher	After	Questionnaire Interviews - individual groups	

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RESEARCH QUESTION	WHAT DATA IS NEEDED	FROM WHOM	WHEN	HOW COLLECTED	COMMENTS
2. What were the effects on teachers?					
2.1. What was the nature of the unit of instruction designed for this project? How was it different from the past as a result of project?	Unit plan	Teachers	3 versions (early draft, plan, final)	Actual material	
2.2. What new things did teachers learn because of the project?	New things learned	Teachers	After	Interviews - individual & group Journal	
2.3. At what level of a subject can collaboration be successful? (i.e. all levels of mathematics courses)	Judgment	Teachers	After	Group interview	
2.4. How have lines of communication among teachers changed?	Impression	Teachers	After	Questionnaire/interviews Journal	
2.5. Did attitude toward teaching, colleagues, and students change? (i.e., enthusiasm for teaching, involvement in teaching, positive feelings)	Attitude	Teachers	After	Questionnaire Journal	Focus on change
3. What was the effect on administration?	Opinion	Administration	After	Interview	

RESEARCH QUESTION	WHAT DATA IS NEEDED	FROM WHOM	WHEN	HOW COLLECTED	COMMENTS
4. What was the effect on school as a whole?					
4.1. How extensively were staff involved in projects? (i.e. number of teachers, counselors, administrators, students)	Count; names and positions	Administration Counselors Teachers	After	Interview/Questionnaire	
4.2. Did the project result in a different mix of students in some courses or classrooms or areas of schools?	Critical incidents	Teacher	During	Questionnaire Journal	
4.3. Did project change (improve) image of vocational courses? Academic courses?	Opinions	Students Teachers	After	Questions Interviews	
4.4. What effects did student learning have on overall school goals and initiatives? (i.e., increase test scores, decreased number of failures, decreased drop out rates, increased attendance, decrease in apathy, increased assurance of mastery with at-risk students, student growth and development)	Impressions	Teachers, administration and counselors	After	Group interviews	Need school goals
5. What was the effect on community?					
5.1. How extensively was community involved?	Who, position	Teachers Counselors	After	Questionnaire	
5.2. Did attitude toward school change? (i.e., level of intent, positive feeling, level of support)	Describe extent of involvement Attitude	Community rep.	After	Questionnaire/Interviews	

RESEARCH QUESTION	WHAT DATA IS NEEDED	FROM WHOM	WHEN	HOW COLLECTED	COMMENTS
6. **What logistics or characteristics of the school system served as facilitators or barriers to project purposes?** (i.e., department structure, funding, time for joint planning, course scheduling, number of teachers involved).	Opinion of barriers and facilitators	Teachers, administration, counselors	After	Interviews and questionnaires	
6.1. How can obstacle or barriers be overcome?	What to do about it	Teachers, administration, counselors	After	Interviews and questionnaires	
7. **Should the project activities be continued?**					
7.1. What could be changed to improve the project purposes and approach?	Opinion	Teachers, administration, counselors	After	Questionnaires/interviews	
7.2. What are possible funding sources for future?	Opinions Existing sources? Why fund?	Administration	After	Interview	Reallocation?

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APPENDIX 5

Data Collection Instruments and Formats

QUESTIONNAIRE

Counselor—Individual

We are very interested to know how this project has affected you.

1. What *new* things did you learn because of this project?

2. Did the project result in a different mix of students in your courses or classroom or area of the school?

3. Tell us your impressions: Did student learning during this project have any effect on your school's goals and initiatives (what goals, what effect)?

4. We are interested in your impressions regarding the lines of communication among teachers and between teachers and counselors. Do you think that the lines of communication have changed? What changes did you notice?

5. In your opinion, what logistics or characteristics of the school system served as *facilitators* to the project purposes?

6. In your opinion, what logistics or characteristics of the school system served as *barriers* to the project purpose?

7. If another high school counselor faced the same barriers, what would you suggest to that teacher to overcome them?

8. In your opinion, did the project change your image of vocational courses?

9. In your opinion, did the project change the your image of academic courses?

10. What was your impression of the community's reaction to the project and its activities?

INTERVIEW

Students—Group

We are interested in hearing your reactions and ideas about two of the purposes of this project.

1. Please describe briefly in your own words what new things you have learned in this class during this project.

2. How could you use what you have learned in this class? (Think about where it fits into your whole life; by that I mean your school work, your family life, your social life, hobbies, or other).

3. Does knowing _____ benefit you? How?

4. In your opinion, did the practical hands-on activities help you to understand these weeks of lessons?

5. Did you see your teacher collaborating with another teacher for this class during the past two weeks? Please tell us about what you observed.

6. During the project, did you attend class with students who are not normally in your classes? Who were they?

7. What was your reaction to attending class in areas of the building which were new to you?

8. In your opinion, did your image of vocational courses change?

9. Did your image of academic courses change?

QUESTIONNAIRE

Teacher—Individual

We are very interested to know how this project has affected you.

1. What *new* things did you learn because of this project?

2. Did the project result in a different mix of students in your courses or classroom or area of the school?

3. Did your students *learn the objectives* of your unit of instruction?

4. Tell us your impressions, did student learning during this project have any effect on your school's goals and initiatives (what goals, what effect)?

5. We are interested in your impressions regarding the lines of communication between teachers. Do you think that the lines of communication among teachers have changed? What changes did you notice?

6. In your opinion, what logistics or characteristics of the school system served as *facilitators* to the project purposes?

7. In your opinion, what logistics or characteristics of the school system served as *barriers* to the project purpose?

8. If another high school teacher faced the same barriers, what would you suggest to that teacher to overcome them?

9. In your opinion, did the project change your image of vocational courses?

10. In your opinion, did the project change your image of academic courses?

INTERVIEW

Teachers—Group

1. Would you recommend including this unit of instruction in the high school curriculum? Why?

2. In your judgment, can collaboration be successful at all levels of the subject you teach? Tell us why you think that it can or cannot.

3. What effects did student learning have on overall school goals and initiatives (i.e., increased test scores, decreased number of failures, decreased dropout rate, increased attendance, decrease in apathy, increased assurance of mastery with at-risk students, developed student growth and development)?

4. Should the project activities be continued?

5. What could be changed to improve the project purposes and approach?

INTERVIEW

Administrator—Individual

We are very interested to know how this project has affected you.

1. What *new* things did you learn because of the project.

2. What effects has it had on the school as a whole?

3. How extensively were staff involved in this project?
   Names? Positions?

4. What effects did student learning have on overall school goals and initiatives?
   Goal? Effect?

5. What logistics or characteristics of the school system served as facilitators of the project purposes?

6. In your opinion, what logistics of the school system served as barriers to the project purposes?

7. If another high school principal faced the same barriers, what would you suggest to that principal to overcome them?

8. In your opinion, should the project activities be continued?

9. What could be changed to improve the project purposes and approach?

10. If project activities were to continue, what funding sources exist? What future sources will there be?

11. Did the project change your image of vocational courses? Of academic courses?